5.6 DESCRIPTION OF PRINCIPAL STRUCTURES, SYSTEMS, AND COMPONENTS

This section provides a general description of the principal SSCs and their required support systems identified in Section 5.5.2. The identification of principal SSCs and their support systems is based on the analysis presented in Sections 5.4 and 5.5.

5.6.1 Description of Principal SSCs and Required Support Systems

Table 5.6-1 lists the principal SSCs, required support systems, and associated safety functions required to satisfy the performance requirements of 10 CFR §70.61. These support systems are also designated as principal SSCs. The receptors associated with each principal SSC are provided in Section 5.5.2. Principal SSCs are described in the following chapters:

- Chapter 5, Integrated Safety Analysis
- Chapter 6, Nuclear Criticality Safety
- Chapter 7, Fire Protection
- Chapter 8, Chemical Process Safety
- Chapter 10, Environmental Protection
- Chapter 11, Plant Systems
- Chapter 15, Management Measures.

Radiation and environmental protection during normal operation and anticipated occurrences (i.e., non-accident conditions) are related to facility safety and are described in Chapters 9 and 10, respectively.

A reference to the applicable SA section describing the design basis for the principal SSC is provided in Table 5.6-1. The level of detail is consistent with the SA purpose of identifying principal SSCs and required safety functions. Management measures required to ensure the availability and reliability of the listed principal SSCs are described in Chapter 15. More detailed descriptions will be provided in the ISA Summary to satisfy the purpose of demonstrating that IROFS are capable of performing their intended safety functions.

5.6.2 MFFF Administrative Controls

The designation of principal SSCs also includes required administrative controls. Administrative controls are those provisions associated with personnel actions necessary to ensure the safe operation of the MFFF. The MFFF design has placed an emphasis on engineered controls over administrative controls to ensure a high degree of system reliability such that a limited number of administrative controls have been identified as principal SSCs. Required administrative controls are listed in Table 5.6-1 and are identified with an asterisk. A description of each administrative control is provided below.

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¹ Table 5.6-1 also lists defense-in-depth SSCs that are not required or credited in the analysis to meet the performance criteria of 10 CFR §70.61.

5.6.2.1 Chemical Safety Controls

Chemical safety controls minimize the likelihood of explosions by ensuring the chemical makeup of the reagents and/or chemical species produced in the AP process are acceptable and that incompatible chemicals are segregated. This program includes both administrative controls and engineering features.

The reagent system chemical safety controls in the reagents building include the following:

- 1. Use of certified chemicals that have been independently certified prior to delivery to the reagents building for storage and use
- 2. Preparation of the reagents by utilizing measured quantities of chemicals and solvents
- 3. Transfer to AP Building (BAP) by the Control Room Operator only if the test results meet reagent chemical composition requirements
- 4. Chemical preparation conducted by trained personnel in accordance with approved procedures
- 5. Limiting quantities of materials stored and maintained

These measures ensure that the proper chemicals are delivered to the AP process from the reagents building.

Low usage reagent chemicals, such as manganese nitrate, are prepared in the BAP from aqueous-based reagent grade chemicals with known compositions that are mixed with measured quantities of chemical additives and the aqueous solvent. Before use, however, these prepared reagents undergo redundant testing procedures to ensure chemical composition. Transfer to head tanks or supply tanks by the Control Room Operator occurs only if the test results meet chemical composition requirements.

To ensure that incompatible chemical species do not propagate through the process, the AP process employs sampling measures to detect for incompatible chemical species. The principal SSC chemical safety controls is used to implement this sampling process and it utilizes the following engineering and administrative measures:

- 1. Isolation of process vessels, as necessary, to ensure a representative sample is obtained and to prevent inadvertent additions after sample is taken and prior to processing of sampled process fluid
- 2. Acquisition of sufficient number of samples to obtain a representative measurement
- 3. Redundant testing of samples to ensure chemical composition
- 4. A means to ensure results of tests performed on samples are correctly conveyed from the laboratory to process unit controller

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In addition, chemical safety controls will ensure the chemicals used in the MFFF laboratories are properly controlled; assuring incompatible chemicals are separated/segregated. To establish these incompatibilities for the laboratory and reagents in general, a complete chemical interaction evaluation will be provided as part of the ISA.

As an additional protection feature, the chemicals in the reagents building are physically separated by type (for example, to ensure that oxidizers are not mixed with reducing compounds). Similarly, the nitric oxide (NOx), solvent (diluent with tributylphosphate), and hydroxylamine nitrate (HAN) are prepared in separate rooms to ensure segregation from incompatible chemicals. These measures, in addition to providing control of the chemical makeup of the reagents prior to piping into the BAP, also provide non-safety protection against chemical events in the BRP. Chapter 8 provides more details related to the chemical safety of the MFFF.

5.6.2.2 Combustible Loading Controls

The principal SSC, combustible loading controls, is used to describe the control of combustible and transient combustible loads by design and the control of transient combustible loads during operations. The design limits the combustible loads inherent in the fixtures and equipment within a fire area. The safety function of these administrative controls is to limit the amount of transient combustible material within a fire area to allowable quantities during operations to ensure that the design basis fire is not exceeded. The administrative controls are enhanced by training, posting, routine house-keeping and periodic surveillance. Fire models will be performed as part of the ISA to demonstrate that combustible loading controls are effective. Refer to Section 7.1 for details about the Fire Protection Program.

5.6.2.3 Material Handling Controls

Material handling controls require loads to be handled using safe practices such that the resulting impacts are within the design basis of the container being handled or that impacts do not damage principal SSCs such that they would be unable to perform their safety functions. The design basis for containers (i.e., 3013 canister, 3013 transport cask, MOX fuel transport cask, waste containers) being lifted is discussed in Section 11.4.11. The safety function of the material handling controls is to ensure that primary confinement containers are handled properly such that, if dropped, there would be no release of radioactive material that could cause consequences that exceed 10 CFR §70.61 or that a drop of a load would not damage a principal SSC such that it would not be able to perform its safety function (such as a breach of a primary confinement that could cause consequences that exceed 10 CFR §70.61).

Loads are handled by qualified personnel, following an approved procedure controlling material to be moved, equipment (including specialized lifting fixtures), training, and precautions and limitations for the movement as applicable. Materials that will be handled by operators as part of the normal production process (pre-engineered production lifts) will have the same requirements as any other load. In addition to trained operators and proper procedures, material handling controls will also ensure the proper equipment is used having a sufficient capacity for the type and weight of load being lifted. Controls associated with the safety function of the principal SSC cranes include required testing and surveillance.

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5.6.2.4 Material Maintenance and Surveillance Programs

The primary means of preventing corrosion-related failures of principal SSCs is through the use of compatible materials within the MFFF fluid systems and to provide separation and segregation of incompatible chemicals. The safety function of the material maintenance and surveillance programs is to supplement these corrosion prevention measures by establishing programs to detect and limit the damage resulting from corrosion (principally to reduce failures associated with corrosion occurring to laboratory and AP gloveboxes containing corrosive chemicals, confinement ducting, and pneumatic transfer lines).

Material maintenance and surveillance programs consist of periodic system-level walkdowns, as well as non-destructive testing programs that can identify corrosion problems within the facility prior to catastrophic failures occurring, and provide a means of taking corrective actions to prevent such failures. These programs are not required to prevent corrosion which could result in small leaks. The frequency of surveillance and maintenance programs will be established based on industry experience.

5.6.2.5 Process Cell Entry Controls

The safety function of the process cell entry controls is to prevent the entry of personnel into process cells during normal operations and to ensure that workers do not receive a dose in excess of limits while performing maintenance in the process cells. The health physics program for the facility, described in chapter 9, includes process cell access controls during normal operations in order to limit radiation exposures. Work within the process area is performed via radiation work permits that are authorized by radiation protection staff. Work activities within radiation areas are monitored by health physics staff and radiation monitors. Process cells and gloveboxes are sealed during normal operations to avoid personnel exposures to airborne plutonium particulate contamination. Radiation monitors are positioned throughout the facility for fast response to confinement failures. Access to such sealed areas is strictly controlled under the health physics program, which also precludes exposures during accident conditions.

5.6.2.6 Facility Worker Action

Where events are obvious to a facility worker and the worker has time to respond by taking self-protecting action, that action is credited in mitigating radiological or chemical consequences to the worker. Section 5.5 identifies several events that may require facility workers to evacuate the room where an event occurs.

Execution of training/qualification programs and the use of procedures are part of the qualitative demonstration of likelihood with respect to a facility worker's actions to protect themselves (e.g., by evacuation). In such circumstances, the facility worker will be aware of the event, and take appropriate action to minimize radiological or chemical exposures.

Worker actions to take self-protection measures are credited in certain scenarios. Much of the training and procedures that constitute management measures in support of these worker actions are provided under the health physics program. The health physics program is established as good management practice for a facility such as this, and pursuant to 10 CFR 20; it also provides for maintaining exposures ALARA, and provides additional protection features in support of

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worker safety. Continuous air radiation monitors are positioned close to work locations and within the ventilation air flow from potential release points. This feature provides additional assurance of an immediate response to a confinement failure. Other fixed air monitors are positioned within the process room for general surveillance. Monitors are designed for extremely high plutonium alpha radiation sensitivity – activity as low as 4 DAC-hours is detected (equivalent to doses in the range of a few millirem). Gloves are routinely surveyed for contamination. Gloves are also replaced frequently to prevent loss of confinement due to glove degradation. All workers are provided with respirators that are designed to filter plutonium particulate. The health physics program, including appropriate training with respect to worker evacuation, the use of respirators, etc., is a management measure that supports the principal SSC of worker actions for self-protection. The health physics program would also control activities associated with the longer-term response to and recovery from events to ensure that exposures are maintained within appropriate limits. The basic elements of the program are summarized in Section 9.2 of the CAR.

5.6.2.7 Laboratory Material Controls

Laboratory material controls consist of administrative procedures that will be used to control the quantity of radiological and chemical materials in the laboratory. The safety function of the laboratory material controls program is to limit the extent of any potential explosion by limiting the quantity of hazardous chemicals that may be involved in the explosion and to limit the quantity of radiological/chemical material available for dispersion following a potential explosion.

Procedures will be developed to establish limits on sample size, the number of samples that may be stored and used in the laboratory overall and in any one laboratory location, and the quantity of chemicals, reagents or other hazardous materials that may be stored and used in a laboratory. Procedures will also be developed to ensure laboratory operations are performed in accordance with safe laboratory operating practices.

5.6.2.8 Hazardous Material Delivery Controls

The safety function of hazardous material delivery controls is to ensure that the quantity of delivered hazardous material and its proximity to the MOX Fuel Fabrication Building structure, Emergency Generator Building structure, and the waste transfer line are controlled to within the bounds of the values used to demonstrate that the consequences of outside explosions are acceptable.

5.6.2.9 Facility Worker Controls

The principal SSC facility worker controls credit the facility worker with taking proper actions prior to commencing an activity that could result in an event with unacceptable dose consequences. This differs from the principal SSC facility worker action where the facility worker is credited with taking self-protective measures to minimize dose consequences as a result of an event. Precautions associated with the radiation protection program (such as the use of a mask) are implemented prior to beginning operations involving, or potentially near to,

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Specifically, in cases where the facility worker is performing a task with transient primary confinements within C3 areas (e.g., during bagout operations), facility worker controls ensure that facility workers take proper actions prior to commencing bag-out operations to prevent and/or limit their dose. Additionally, facility workers take proper actions prior to commencing maintenance activities in AP/MP C3 Areas to prevent and/or limit their exposure.

Similar to facility worker actions, many of the procedures and training that constitute management measures in support of these facility worker controls are provided under the health physics program. These measures provide a basis for the good planning of work tasks associated with the aforementioned activities. The health physics program is established as good management practice for a facility such as this, and pursuant to 10 CFR 20; it also provides for maintaining exposures ALARA, and provides additional protection features in support of worker safety. The basic elements of the program are summarized in Section 9.2 of the CAR.

5.6.3 Sole Principal IROFS

A list identifying IROFS that are the sole item preventing or mitigating an accident sequence whose risk could exceed the performance requirements of 10 CFR §70.61 will be provided in the ISA Summary submitted with the license application for possession and use of SNM.

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Tables

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Table 5.6-1. MFFF Principal SSCs

Principal SSC	Safety Function	SA Design Basis Reference
3013 Canister	Withstand the effects of design basis drops without breaching	11.4.11
3013 Transport Cask	Withstand the design basis fire without breaching	11.4.11
	Withstand the effects of design basis drops without release of radioactive material	
Backflow Prevention Features	Prevent process fluids from back-flowing into interfacing systems.	11.8.7
C2 Confinement System Passive Barrier	Limit the dispersion of radioactive material	11.4.11
C3 Confinement System	Provide filtration to mitigate dispersions from the C3 areas	11.4.11
	Remain operable during design basis fire and effectively filter any release	
	Limit the dispersion of radioactive material	j
	Provide exhaust to ensure that temperature in the 3013 canister storage structure is maintained within design limits	
	Provide cooling air exhaust from designated electrical rooms	
C4 Confinement System	Provide design features to ensure that final C4 HEPA filters are not impacted by fire	11.4.11
	Maintain a negative glovebox pressure differential between the glovebox and the interfacing systems	
	Maintain minimum inward flow through small glovebox breaches	
	Ensure that C4 exhaust is effectively filtered	
	Operate to ensure that a negative pressure differential exists between the C4 glovebox and the C3 area	
	Contain a chemical release within a glovebox and provide an exhaust path for removal of the chemical vapors	

Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Chemical Safety Controls*	Ensure that explosive concentrations of hydrogen peroxide do not occur	5.6.2.1
	Ensure a diluent is used that is not very susceptible to either nitration or radiolysis	
	Ensure that quantities of organics are limited from entering process vessels containing oxidizing agents and at potentially high temperatures	ža, v
	Ensure that hydrazoic acid is not accumulated in the process or propagated to units that might lead to explosive conditions	
	Ensure metal azides are not introduced into high temperature process equipment	
	Ensure the sodium azide has been destroyed prior to the transfer of the alkaline waste to the waste recovery unit	
	Ensure the valance of the plutonium prior to oxalic acid addition is not VI	
	Ensure that nitric acid, metal impurities, and HAN concentrations are controlled and maintained to within safety limits	
	Ensure concentrations of HAN, hydrazine nitrate, and hydrazoic acid are controlled to within safety limits	
	Ensure the proper concentration of hydrazine nitrate is introduced into the system	
	Ensure control of the chemical makeup of the reagents and ensure segregation/ separation of vessels/components from incompatible chemicals	

Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Combustible Loading Controls*	Limit the quantities of combustibles in the filter area to ensure that the C4 final HEPA filters are not adversely impacted by a filter room fire	5.6.2.2
	Limit the quantity of combustibles in fire areas containing a storage glovebox such that any fire that may occur will not encompass a large fraction of the stored radiological material.	24.9
·	Limit the quantity of combustibles in a fire area containing 3013 canisters to ensure that the canisters are not adversely impacted by a fire	
	Limit the quantity of combustibles in a fire area containing 3013 transport casks to ensure that the cask design basis fire is not exceeded	
	Limit the quantity of combustibles in a fire area containing fuel rods to ensure that the fuel rods are not adversely impacted by a fire	
	Limit the quantity of combustibles in a fire area containing MOX fuel transport casks to ensure that the cask design basis fire is not exceeded	•.
	Limit the quantity of combustibles in a fire area containing transfer containers to ensure that the containers are not adversely impacted by a fire	
	Limit the quantity of combustibles in areas containing the pneumatic transfer system to ensure this system is not adversely impacted	
Criticality Control	Prevent criticality events	6.4
Double-Walled Pipe	Prevent leaks from pipes containing process fluids from leaking into C3 areas	11.8.7

Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Emergency AC Power System	Provide AC power to emergency DC system battery charger	11.5.7
	Provide AC power to emergency diesel generator fuel oil system	
	Provide AC power to high depressurization exhaust system	
	Provide AC power to C4 confinement system	
	Provide AC power to emergency control room air-conditioning system	est
	Provide AC power to emergency diesel generator ventilation system	
	Provide AC power to emergency control system	
·	Provide AC power to seismic monitoring system and seismic isolation valves	
Emergency Control Room Air-Conditioning System	Ensure habitable conditions for operators	11.4.11
Emergency Control System	Provide controls for high depressurization exhaust system	11.6.7
	Provide controls for C4 confinement system	
	Provide controls for emergency control room air-conditioning system	
	Provide controls for emergency AC system	
	Provide controls for emergency DC system	
	Provide controls for emergency generator ventilation system	
	Provide controls for emergency diesel generator fuel oil system	
	Shut down process on loss of power	
	Shut down and isolate process and systems, as necessary, in response to an earthquake	

Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Emergency DC Power System	Provide DC power for high depressurization exhaust system	11.5.7
	Provide DC power for C4 confinement system	
	Provide DC power for emergency AC power system controls	
	Provide DC power for emergency control room air-conditioning system	
	Provide DC power for emergency control system	u.s
	Provide DC power for emergency generator ventilation system	
Emergency Generator Building Structure	Maintain structural integrity and prevent damage to internal SSCs from external fires, external explosions, earthquakes, extreme winds, tornadoes, missiles, rain, and snow and ice loadings	11.1.7
Emergency Generator Ventilation System	Provide emergency diesel generator ventilation	11.4.11
Emergency Diesel Generator Fuel Oil System	Provide emergency diesel generator fuel oil for the emergency diesels	11.5
Facility Worker Action*	Ensure that facility worker takes proper action to limit chemical and radiological exposure	5.6.2.6
Facility Worker Controls*	Ensure that facility workers take proper actions prior to bag-out operations to limit radiological exposure.	5.6.2.9
	Ensure that facility workers take proper actions during maintenance activities to limit radiological exposure.	5.6.2.9
Fire Barriers	Contain fires within a single fire area	7.5.3
Fire Detection and Suppression	Support fire barriers as necessary	7.5.3

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Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Fluid Transport Systems	Ensure that vessels, tanks, and piping are designed to prevent process deviations from creating over-pressurization events	11.8.7
	Withstand as necessary the effects of the DBE such that confinement of radionuclides is maintained	11.8.7
Glovebox	Maintain confinement integrity for design basis impacts	11.4.11
Glovebox Pressure Controls	Maintain glovebox pressure within design limits	11.4.11
Hazardous Material Delivery Controls*	Ensure that the quantity of delivered hazardous material and its proximity to the MOX Fuel Fabrication Building structure, Emergency Generator Building structure, and the waste transfer line are controlled to within the bounds of the values used to demonstrate that the consequences of outside explosions are acceptable.	5.6.2.8
Instrument Air System (Scavenging Air)	Provide sufficient scavenging airflow to dilute the hydrogen produced by radiolysis such that an explosive condition does not occur	11.9.5
Laboratory Material Controls*	Minimize quantities of hazardous chemicals in the laboratory	5.6.2.7
	Minimize quantities of radioactive materials in the laboratory	5.6.2.7
Controls*	Ensure proper handling of primary confinement types outside of gloveboxes	5.6.2.3
	Ensure that design basis lift heights of primary confinement types (3013 canister, 3013 transport cask, MOX fuel transport cask, and transfer containers) are not exceeded	
	Prevent load handling activities that could potentially lead to a breach in the final C4 HEPA filters	.*

Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
	Prevent impacts to the glovebox during normal operations from loads outside or inside the glovebox that could exceed the glovebox design basis	5.6.2.3
	Prevent load handling events that could breach primary confinements	
Material Handling Equipment	Limit damage to fuel rods/assemblies during handling operations	11.7.7
	Prevent impacts to the glovebox through the use of engineered equipment	
Material Maintenance and Surveillance Programs*	Detect and limit the damage resulting from corrosion	5.6.2.4
MFFF Tornado Dampers	Protect MFFF ventilation systems from differential pressure effects of the tornado	11.4.11
Missile Barriers	Protect MOX Fuel Fabrication Building and Emergency Generator Building internal SSCs from damage caused by tornado- or wind-driven missiles	11.1.7
MOX Fuel Fabrication Building Structure (including vent stack)	Maintain structural integrity and prevent damage to internal SSCs from external fires, external explosions, earthquakes, extreme winds, tornadoes, missiles, rain, and snow and ice loadings	11.1.7
	Withstand the effects of load drops that could potentially impact radiological material	
MOX Fuel Transport Cask	Withstand the design basis fire without breaching	11.4.11
	Withstand the effects of design basis drops without release of radioactive material	
Offgas Treatment System	Provide an exhaust path for the removal of gases in process vessels	11.4.11
Pressure Vessel Controls	Ensure that primary confinements are protected from the impact of pressure vessel failures (bulk gas, breathing air, service air, and instrument air systems)	11.9.5
Process Cells	Contain fluid leaks within process cells	11.4.11

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Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Process Cell Entry Controls*	Prevent the entry of personnel into process cells during normal operations	5.6.2.5
	Ensure that workers do not receive a radiological or chemical exposure in excess of limits while performing maintenance in the AP process cells	
Process Cell Fire Prevention Features	Ensure that fires in the process cells are highly unlikely	7.5.3
Process Cell Ventilation System Passive Boundary	Provide filtration to limit the dispersion of radioactive material	11.4.11
Process Safety Control Subsystem		System design basis provided in 11.6.7. As necessary, basis for parameters provided as shown
	Prevent the formation of an explosive mixture of hydrogen within the MFFF facility associated with the use of the hydrogen-argon gas	8.5
	Ensure isolation of sintering furnace humidifier water flow on high water level	11.4.11 (See Sintering Furnace)
	Ensure the temperature of solutions containing HAN is limited to temperatures within the safety limits	8.5
	Control the flowrate into the oxidation column	8.5
	Ensure the temperature of solutions containing organic is limited to temperatures within safety limits	8.5
	Limit the residence time of organics in process vessels containing oxidizing agents and potentially exposed to high temperatures and in radiation fields	8.5
	Ensure the temperature of solutions potentially containing hydrazoic acid is limited to prevent an explosive concentration of hydrazoic acid from developing	8.5

Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Process Safety Control Subsystem (continued)	Limit and control conditions under which dry-out can occur	8.5
	Ensure the temperature of solutions potentially containing metal azides is insufficient to overcome the activation energy needed to initiate the energetic decomposition of the azide	8.5
	Ensure the normality of the nitric acid is sufficiently high to ensure that the offgas is not flammable and to limit excessive hydrogen production	8.5 as
	Warn operators of glovebox pressure discrepancies prior to exceeding differential pressure limits	11.4.11
	Shut down process equipment prior to exceeding temperature safety limits	11.4.11
	Ensure the temperature of solutions containing solvents is limited to temperatures within safety limits	8.5
	Ensure the flow rate of nitrogen dioxide/ dinitrogen tetroxide is limited to the oxidation column of the purification cycle	8.5
Seismic Monitoring	Prevent fire and criticality as a result of	11.6.7 – for system
System and Associated Seismic Isolation Valves	an uncontrolled release of hazardous material and water within the MFFF Building in the event of an earthquake	11.8.7 – for valves
Sintering Furnace	Provide a primary confinement boundary against leaks into C3 areas	11.4.11
Sintering Furnace Pressure Controls	Maintain sintering furnace within design limits	11.4.11
Supply Air System	Provide unconditioned emergency cooling air to the storage vault and designated electrical rooms	11.4.11
Transfer Container	Withstand the effects of design basis drops without breaching	11.4.11

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Table 5.6-1. MFFF Principal SSCs (continued)

Principal SSC	Safety Function	SA Design Basis Reference
Waste Containers	Ensure that hydrogen buildup in excess of limits does not occur while providing appropriate confinement of radioactive materials	11.4.11
Waste Transfer Line	Ensure that the waste transfer line is protected from activities taking place outside the MOX Fuel Fabrication Building	10.5
	Prevent damage to the line from external fires, explosions, earthquakes, extreme winds, tornadoes, missiles, rain, and snow and ice loadings	10.5

^{*} Administrative control

5.7 GENERAL SA AND ISA COMMITMENTS

The SA is the first step in the ISA process. In the ISA Summary submitted with the license application for possession and use of SNM, IROFS will be identified. The safety function of each of the IROFS required to satisfy the performance requirements of 10 CFR §70.61 will be included. Methods for conducting the ISA and additional detailed analyses have been discussed previously in this and other chapters. The following sections describe DCS' programmatic commitments for performance and continuation of the ISA process.

5.7.1 Process Safety Information

DCS will maintain written process safety information for the MFFF, which will be used to update the ISA and to identify and understand the hazards associated with the processes. The process safety information will include the following:

- A description of the hazards, including information of the pertinent chemical or physical properties of hazardous materials (e.g., toxicity, acute exposure limits, reactivity, chemical and thermal stability, or other applicable information that would typically be included on Material Safety Data Sheets)
- A description of the equipment used in the process (e.g., information of a general nature on such topics as the materials of construction, piping and instrumentation diagrams, ventilation, design codes and standards employed, material and energy balances, safety systems, interlocks, detection or suppression systems, electrical classification, relief system design, and the design bases)
- A description of the technology of the process (e.g., block flow diagrams or simplified process flow diagrams, a brief outline of the process chemistry, safe upper and lower limits for controlled parameters, and an evaluation of the health and safety consequences of process deviations).

This information is contained in analyses, specifications, drawings, and other documentation that is prepared, reviewed, and approved in accordance with design control and configuration management processes described in Chapter 15.

5.7.2 ISA Updating

To ensure the continued accuracy of the ISA, DCS has made commitments to management measures, such as quality assurance, the configuration management system, and operating procedures. These commitments are contained in Chapter 15 and ensure the timely updating of the ISA. In particular, the ISA will be conducted in accordance with approved QA procedures for performing (and maintaining), reviewing, and approving analyses in accordance with design control procedures, and maintaining associated documentation in accordance with records management procedures. These processes and procedures are controlled under the MPQAP. Organizational responsibilities and administrative policies are given in Chapter 4.

Following issuance of the license for possession and use of SNM:

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- DCS will update the ISA Summary annually if changes occur that affect the ISA
 Summary. Changes in the process safety information or other site or facility changes that
 may alter the parameters of accident sequences will be evaluated. DCS will revise the
 ISA using an ISA team with qualifications appropriate for the nature of the change.
 IROFS and appropriate management measures will be implemented based on the results
 of the ISA.
- DCS commits to promptly addressing any safety-significant vulnerabilities or unacceptable performance deficiencies identified in the ISA. Whenever the ISA is updated, DCS will take prompt and appropriate actions to address any vulnerabilities that may have been identified. If a proposed change results in a new type of accident sequence or results in a change in the consequences, as defined in 10 CFR §70.61, to an unacceptable level, DCS commits to promptly evaluating the adequacy of existing IROFS and associated management measures and making necessary changes, if required.

5.7.3 Facility Changes

Upon issuance of the license to possess and use SNM, DCS will control facility changes in accordance with the following requirements:

- DCS will implement a configuration management system, as described in Chapter 15, to
 evaluate, implement, and track each change to the site, structures, processes, systems,
 equipment, components, computer programs, and activities of personnel. This system will be
 documented in written procedures. The following will be addressed prior to implementing
 any change:
 - The technical basis for the change;
 - Impact of the change on safety and health or control of licensed material;
 - Modifications to existing operating procedures including any necessary training or retraining before operation;
 - Authorization requirements for the change;
 - For temporary changes, the approved duration (e.g., expiration date) of the change; and
 - The impacts or modifications to the ISA, ISA Summary, or other safety program information, developed in accordance with 10 CFR §70.62.
- Any change to the site, structures, processes, systems, equipment, components, computer
 programs, and activities of personnel will be evaluated, as described above, before the
 change is implemented. The evaluation of the change will determine, before the change is
 implemented, if an amendment to the license is required to be submitted in accordance with
 10 CFR §70.34.
- Pursuant to 10 CFR §70.72, DCS may make changes to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel, without prior NRC approval, if the change:

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- Does not create new types of accident sequences that, unless mitigated or prevented, would exceed the performance requirements of 10 CFR §70.61 and that have not previously been described in the ISA Summary; or
- Does not use new processes, technologies, or control systems for which DCS has no prior experience;
- Does not remove, without at least an equivalent replacement of the safety function, an item relied on for safety that is listed in the ISA Summary;
- Does not alter any item relied on for safety, listed in the ISA Summary, that is the sole item preventing or mitigating an accident sequence that exceeds the performance requirements of 10 CFR §70.61; and
- Is not otherwise prohibited by 10 CFR §70.72, license condition, or order.
- Changes will be communicated to the NRC as follows:
 - For changes that require pre-approval under 10 CFR §70.72, DCS will submit an amendment request to the NRC in accordance with 10 CFR §70.34 and §70.65.
 - For changes that do not require pre-approval under 10 CFR §70.72, DCS will submit to the NRC annually, within 30 days after the end of the calendar year during which the changes occurred, a brief summary of all changes to the records required by 10 CFR §70.62(a)(2).
 - For all changes that affect the ISA Summary, DCS will submit to the NRC annually, within 30 days after the end of the calendar year during which the changes occurred, revised ISA Summary pages.
- If a change covered by 10 CFR §70.72 is made, the affected onsite documentation will be updated promptly.
- DCS will maintain records of changes to its facility carried out under 10 CFR §70.72. These records will include a written evaluation that provides the bases for the determination that the changes do not require prior NRC approval under paragraph (c) or (d) above. These records will be maintained until termination of the license.

Changes to the design prior to issuance of the license to possess and use SNM are discussed in Section 15.2.

5.7.4 Other Commitments

DCS will use personnel with appropriate experience and expertise in engineering and process operations to update the ISA and keep it current. The ISA team for a process will include individuals knowledgeable in ISA methodology and in the operation and hazards of the particular process. The SA team described in Section 5.2 will be supplemented with personnel with such experience as appropriate.

DCS commits to implementing and maintaining IROFS to ensure the required reliability and availability to satisfy the performance requirements of 10 CFR Part 70. The management

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measures described in Chapter 15 comprise the principal mechanism by which the reliability and availability of IROFS are ensured.

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Appendix 5A Tables

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Table 5A-1. Unmitigated Event Description - Example

Event Type/ Workshop or Location/	Unmitigated Event Description/ Specific Location/ Hazard Sources	Cause
Event Number		
Event type: fire, explosion, dispersion of radioactive material, etc.	Description of unmitigated event including equipment, effects of event and applicable hazardous materials, without application of principal SSCs.	Event cause
Applicable Workshop or Support Group:	Specific Location:	
Aqueous Polishing, Powder, Pellet, etc.	Specific process unit(s) in which event may occur.	. 229
Alphanumeric event number.	Mode:	
	Applicable facility operating mode. Normal Operation, Startup, Short Shutdown, Long Shutdown,	
Event type designator: E-1	All	
through E-9.	Hazard Sources:	
	Hazardous material involved in event, radioactive or hazardous chemical	

Table 5A-2. Unmitigated Events, Aqueous Polishing

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire Aqueous Polishing AP-1	A fire involving the AP Calcining Furnace results in an energetic breach of the AP Calcining Furnace Glovebox and the dispersal of radiological materials.	Oxygen line leak or break and high temperature ignition source
E-1	Specific Location: AP-Precipitation-Filtration-Oxidation (Calcining Furnace Glovebox) Mode: Normal Operation Hazard Sources:	
	Radiological Material (maximum inventory in AP Calcining Furnace)	
Internal Fire Aqueous Polishing AP-2	A solvent fire involving AP Glovebox results in an energetic breach of the AP Glovebox and the dispersal of radiological materials. Specific Location:	Temperature of solvent above flashpoint and ignition source
E-1	AP-Solvent recovery AP-Purification cycle AP-Sampling Mode: All Hazard Sources: Radiological Material (maximum inventory in fire area)	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop or Location/	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Event Number		
Internal Fire	A solvent fire involving AP vessels, tanks and	1. Temperature of solvent
	piping in AP Process Cell results in an energetic	above flashpoint and ignition
Aqueous Polishing	breach of the AP vessels, tanks and piping and	source
Aqueous Fonsining	the dispersal of radiological materials.	502170
	the dispersal of fathological materials.	
AP-3		
	Specific Location:	
	AD 0-1	
	AP-Solvent recovery	
E-1	AP-Purification cycle	
	AP-Liquid Waste Reception	
		21.9
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	AP Process Cell including inventory in AP	
	vessels, tanks and piping)	·
		1. Combustible material and
Internal Fire	A fire involving AP vessels, tanks and piping	
	and combustible material in AP Process Cell	ignition source
Aqueous Polishing	results in an energetic breach of the AP vessels,	
	tanks and piping and the dispersal of radiological	
AP-4	materials.	,
	a text contains	
	Specific Location:	
E-1	AP-Solvent recovery	·
D-1	AP-Precipitation-Filtration-Oxidation	
	AP-Sampling	
]
	AP-Oxalic mother liquors recovery	
	AP-Off gas treatment	
	AP-Liquid waste reception	•
	AP-Dissolution	Ī
	AP-Dissolution of chlorinated feed	
	AP-Acid recovery	
	AP-Purification cycle	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	1
Į.		•
	AP Process Cell including inventory in AP vessels, tanks and piping)	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	1
or Location/		
Event Number		*
Internal Fire	A fire involving combustible materials and a	Combustible material and
	tank containing raffinates in AP Process Cell	ignition source
Aqueous Polishing	results in an energetic breach of the AP vessels,	I ignition source
riqueous i onsums	tanks and piping and the dispersal of radiological	
AP-40	materials.	
AF-40	inateriais.	
	Specific Location:	
. .		
E-1	AP-Acid recovery	
	AP-Purification cycle	
	AP-Liquid Waste Reception	
		us
	Mode: All	
	Hazard Sources:	
	Waster at a track and a second	
	Radiological Material (maximum inventory in	
	raffinates tank in AP Process Cell)	
Internal Fire	ANT	
micmai rife	All Internal Fire events for MFFF-Gloveboxes	
A	apply to Aqueous Polishing, as far as description	
Aqueous Polishing	and causes are concerned, and are bounding in	
	terms of consequences. (Refer to MFFF	
AP-5	Gloveboxes, Events GB-1 and GB-2)	
	Specific Location:	
	A70 A -24	
F. 1	AP-Acid recovery	
E-1	AP-Solvent recovery	
	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Mode: All	
	Hazard Sources:	
	Hazard Sources.	
	Radiological Material (maximum inventory in AP glovebox)	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop or Location/	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Event Number		
Explosion	Radiolysis induced hydrogen buildup in the	1. Loss of normal dilution air
<u> </u>	vapor space of an AP vessel, tank or piping (in	flow
Aqueous Polishing	AP process cell or glovebox) results in a	2. Loss of offgas exhaust flow
. Mees as a comment	hydrogen explosion (given an ignition source),	1
AP-6	an energetic breach of the AP vessel, tank or	
	piping, and the dispersal of radiological	
	materials.	
E-2	Specific Location:	
	AP-PuO2 Decanning	
	AP-Solvent recovery	
	AP-Precipitation-Filtration-Oxidation	23
	AP-Oxalic mother liquors recovery	
	AP-Dissolution	}
	AP-Dissolution of chlorinated feed	
0.00	AP-Purification cycle	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in AP vessel)	
	M vessely	
Explosion	Radiolysis induced hydrogen buildup in the	1. Loss of normal dilution air
	vapor space of a raffinates tank (in AP process	flow
Aqueous Polishing	cell) results in a hydrogen explosion (given an ignition source), an energetic breach of the AP	2. Loss of offgas exhaust flow
AP-41	vessel, tank or piping, and the dispersal of	
AP-41	radiological materials.	
	Specific Location:	
E-2	AP-Acid recovery	
	AP-Purification cycle	
ī	AP-Liquid Waste Reception	
•	Made: All	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	raffinates tank in AP Process Cell)	
	- The assessment of the same o	

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Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion	A process-related chemical over-pressurization involving flammable, explosive, or reactive	1. Corrosive chemicals interact with
AP-7	chemicals in AP vessels, tanks and piping (in AP process cell or glovebox) results in an energetic breach of the AP vessels, tanks and piping and the Dispersal of Nuclear Materials.	vessels/piping/associated equipment 2. Incorrect chemical handling 3. Incorrect reagent
E-2	Specific Location:	preparation 4. Temperature of chemical(s) above flashpoint
	AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Uranium Dissolution AP-Acid recovery AP-Purification cycle	5. Hydrogen or other explosive gas released due to incompatible chemical addition errors 6. Explosive gas and electrical short 7. Explosive gas and unknown ignition source
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in AP vessels, tanks and piping)	
Explosion	A process-related chemical explosion involving	Incorrect or excessive
Aqueous Polishing	HAN/Nitric Acid in AP vessels, tanks and piping (in AP process cell or glovebox) results in an	chemical addition 2. Incorrect or excessive
AP-8	energetic breach of the AP vessels, tanks and piping and the Loss of Confinement / Dispersal of Nuclear Materials.	chemical addition and failure to perform required sampling of AP solutions 3. Incorrect reagent
E-2	Specific Location:	preparation 4. Reagent concentration due
	AP-Purification cycle AP-Precipitation-Filtration-Oxidation AP-Solvent Recovery AP-Acid Recovery AP-Oxalic Mother Liquors Recovery	to evaporation 5. Explosive gas and electrical short 6. Explosive gas and unknown ignition source
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in AP vessels, tanks and piping)	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/		
Event Number		1 The second of the second
Explosion	A process-related chemical explosion involving	Incorrect or excessive chemical addition
	hydrazoic acid in AP vessels, tanks and piping	2. Incorrect or excessive
Aqueous Polishing	(in AP process cell or glovebox) results in an energetic breach of the AP vessels, tanks and	chemical addition and failure
AP-9	piping and the Loss of Confinement / Dispersal	to perform required sampling
AP-9	of Nuclear Materials.	of AP solutions
	of Nuclear Materials.	3. Incorrect reagent
		preparation
E-2		4. Temperature of chemical(s)
	Specific Location:	above flashpoint
		5. Explosive gas and electrical
	AP-Purification cycle	short
	AP-Solvent Recovery	6. Explosive gas and unknown
	AP-Precipitation-Filtration-Oxidation	ignition source
	AP-Off gas treatment	
	AP-Oxalic Mother Liquors Recovery	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	AP vessels, tanks and piping)	
Explosion	Over-pressurization involving AP vessels, tanks	1. Control system failure
	and piping (i.e., evaporator or boiler) inside an	
Aqueous Polishing	AP Process Cell results in an energetic breach of	
	the AP vessels, tanks and piping, and the	1
AP-20	dispersal of radiological materials.	
	Specific Location:	
E-2	AP-Oxalic mother liquors recovery	
E-2	AP-Acid recovery	
	Mode: Normal Operation	
	Hazard Sources:	ļ
	Radiological Material (maximum inventory in	
	evaporator in AP Process Cell)	
		<u> 1</u>

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Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion	A process-related chemical explosion involving hydrogen peroxide (in AP process cell or	Human error or equipment failure
Aqueous Polishing	glovebox) in AP vessels, tanks and piping results in an energetic breach of the AP vessels, tanks	-
AP-37	and piping and the Loss of Confinement / Dispersal of Nuclear Materials.	
E-2	Specific Location:	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	±2.9
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in AP vessels, tanks and piping)	
Explosion	A process-related chemical explosion involving solvents in AP vessels, tanks and piping (in AP	1. Explosive concentration of solvent vapors in a confined
Aqueous Polishing	process cell or glovebox) results in an energetic breach of the AP vessels, tanks and piping and	space with an ignition source
AP-38	the Loss of Confinement / Dispersal of Nuclear Materials.	·
E-2	Specific Location:	
	AP-Purification cycle	
	AP-Solvent recovery AP-Liquid Waste Reception	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in AP vessels, tanks and piping)	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

		
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/		
Event Number		1 m 125 C
Explosion	A process-related chemical explosion involving	1. Temperature above 135 C
* /	red oil formation (nitrates or nitric acid solutions	in boiler, vessel, or tank and
Aqueous Polishing	of heavy metals and TBP at temperatures in	presence of nitrates or nitric
	excess of 135 C) in AP boiler, vessel, or tank (in	acid solutions of heavy metals
AP-39	AP process cell or glovebox) results in an	and TBP
	energetic breach of the AP boiler, vessel, or tank	
	and the Loss of Confinement / Dispersal of	
	Nuclear Materials.	
E-2		
	Specific Location:	
		` 23
[AP-Purification cycle	
İ	AP-Solvent recovery	
	AP-Acid recovery	
	AP-Liquid Waste Reception	
	AP-Precipitation-Filtration-Oxidation	
	AP-Oxalic mother liquors recovery	
Marie Carlos Carlos	2.16 * 1 * 1 * 1 * 1 * 1 * 1 * 1 * 1 * 1 *	
	Mode: All	
		7
	Hazard Sources:	1
and the second second		1
	Radiological Material (maximum inventory in	
	AP vessels, tanks and piping)	
		1 125.0
Explosion	A process-related chemical explosion involving	1. Temperature above 135 C
	an azide (other than hydrazoic acid) in an AP	in boiler, vessel, or tank and
Aqueous Polishing	boiler, vessel, or tank (in an AP cell or glovebox)	presence of azide solutions.
	results in an energetic breach of the AP boiler,	
AP-44	vessel, or tank and the Loss of Confinement /	
	Dispersal of Nuclear Materials.	
		ţ ·
	Carries I acresses	
E-2	Specific Location:	
	AP-Purification cycle	1
	AP-Solvent recovery	
	AP-Liquid Waste Reception	
	Mode: All	1
	MOR. All	
1	Hazard Sources:	
	Hazard Sources.	
	Radiological Material (maximum inventory in	1
	AP vessels, tanks and piping)	
	At vessers, tames and priving)	Į.
	<u> </u>	<u> </u>

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Front	Hamitigated Pront Description Charles	Cause
Event Type/Workshop	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
or Location/	Location Hazara Sources	
Event Number		
Explosion	Electrolysis-induced hydrogen buildup in the	1. Incorrect chemical handling
LAPIOSIOII	vapor space of an electrolyzer results in a	
Aqueous Polishing	hydrogen explosion and the dispersal of	2. Incorrect reagent preparation
Aqueous Folishing	radiological materials.	3. Hydrogen or other
AP-47	radiological materials.	explosive gas released due to
AF-41		incompatible chemical
	Specific Location:	addition errors
	Specific Executors.	4. Explosive gas and electrical
E-2	AP-Dissolution	short
12-2	AP-Dissolution of chlorinated feed	5. Explosive gas and unknown
	Ar-Dissolution of Chlorinated leed	ignition source
	Mode: All	igindon source
•	Mode. All	` ==
	Hazard Sources:	
1	annel & JUHI Cor.	1
	Radiological Material (maximum inventory in	
	AP vessels, tanks and piping)	
	The vocation and property	
Explosion	A process-related chemical explosion involving	1. Incorrect chemical handling
	plutonium (VI) in the calcining furnace results in	2. Incorrect reagent
Aqueous Polishing	an energetic breach of the furnace and glovebox	preparation
1	and the dispersal of radiological materials.	3. Hydrogen or other
AP-48		explosive gas released due to
		incompatible chemical
	Specific Location:	addition errors
		4. Explosive gas and electrical
E-2	AP-Precipitation-Filtration-Oxidation	short
	. · · · · ·	5. Explosive gas and unknown
•	Mode: All	ignition source
	Hazard Sources:	
ŀ	_	
	Radiological Material (maximum inventory in	
	AP vessels, tanks and piping)	
<u> </u>		
Explosion	A process-related chemical explosion involving	1. Corrosive chemicals
A	liquid addition to the calcining furnace results in	interact with vessels/piping/
Aqueous Polishing	an energetic breach of the furnace and glovebox	associated equipment
AP-49	and the dispersal of radiological materials.	2. Incorrect chemical handling
AF-47		Incorrect reagent preparation
	Specific Location:	4. Temperature of chemical(s)
	Specific Excauou.	above flashpoint
E-2	AP-Precipitation-Filtration-Oxidation	5. Hydrogen or other
		explosive gas released due to
	Mode: All	incompatible chemical
		addition errors
1	Hazard Sources:	6. Explosive gas and electrical
		short
1	Radiological Material (maximum inventory in	7. Explosive gas and unknown
1	AP vessels, tanks and piping)	ignition source
	The state of the s	
	I	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material Aqueous Polishing	Excessive temperature of AP Calcining Furnace results in high temperature damage to and breach of the AP Calcining Furnace Glovebox and the dispersal of radiological materials.	Control system failure Loss of cooling of process equipment by glovebox ventilation
AP-10	Specific Location:	
E-3	AP-Precipitation-Filtration-Oxidation (Calcining Furnace Glovebox) Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in AP Calcining Furnace Glovebox)	32. 9
Loss of Confinement / Dispersal of Nuclear Material Aqueous Polishing AP-11 E-3	Excessive temperature of AP Electrolyzer results in high temperature damage to and breach of the AP Electrolyzer and damage to the glovebox panels and the dispersal of radiological materials. Specific Location: AP-Dissolution (Electrolyzer Glovebox) AP-Dissolution of chlorinated feed Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in	Control system failure Electric isolation failure Loss of cooling to process equipment

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	01020
or Location/		i
Event Number		
Loss of	Corrosion of an AP Glovebox by corrosive	1. Corrosive chemicals
Confinement /	chemicals results in a breach (i.e., material	interact with AP glovebox
Dispersal of	failure) of glovebox confinement and dispersal	leading to failure
Nuclear Material	of radiological materials.	
Aqueous Polishing	Specific Location:	
AP-12	AP-Acid recovery	
	AP-Solvent recovery	
	AP-Precipitation-Filtration-Oxidation	
	AP-Sampling	
E-3	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	AP glovebox)	
		:
Loss of	Back-flow from the AP Calcining Furnace	1. Loss of gas flow through
Confinement /	through a nitrogen or oxygen supply line to an	the supply line and failure of
Dispersal of	interfacing system followed by the opening of	pipes and valves
Nuclear Material	this interfacing system (during operation or	
	maintenance) results in a breach of glovebox	
Aqueous Polishing	primary confinement and dispersal of	
	radiological materials to areas where workers	
AP-13	might be present.	
AP-13	might be present.	
E-3	Specific Location:	
	Specific Location:	
	Specific Location: AP-Precipitation-Filtration-Oxidation (Calcining Furnace Glovebox)	
	Specific Location: AP-Precipitation-Filtration-Oxidation (Calcining)	
	Specific Location: AP-Precipitation-Filtration-Oxidation (Calcining Furnace Glovebox)	
	Specific Location: AP-Precipitation-Filtration-Oxidation (Calcining Furnace Glovebox) Mode: All	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of	Back-flow from AP vessels, tanks and piping	1. Loss of gas flow through
Confinement /	through a supply line (e.g., compressed air,	the supply line and failure of
Dispersal of	bubbler transmitter line) to an interfacing system	pipes and valves
Nuclear Material	followed by the opening of this interfacing	p.pos m.c. vm·os
14UCICAI IVIAICIIAI	system (during operation or maintenance) results	i
Aqueous Polishing	in a breach of primary confinement and dispersal	
Addeous I onsiming	of radiological materials to areas where workers	
AP-14	might be present.	
M-14	amgint be presented	,
	Specific Location:	
E-3	AP-PuO2 Decanning	24.7
	AP-PuO2 Canning	
	AP-Solvent recovery	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	1
	AP-Oxalic mother liquors recovery	
	AP-Off gas treatment	į
	AP-Liquid waste reception	İ
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Acid recovery	·
	AP-Purification cycle	
	AP-Sampling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in AP vessel, tank or piping)	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

	- · ·	
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/	,	
Event Number		
Loss of	A break or leakage in AP vessels, tanks and	1. Corrosion of AP vessels,
Confinement /	piping within AP Process Cell results in a breach	tanks and piping
Dispersal of	of confinement, and the dispersal of radiological	2. Mechanical failure of AP
Nuclear Material	materials.	vessels, tanks and piping
	, '	Freeze, same page property
Aqueous Polishing	Specific Location:	
AP-16	AP-Solvent recovery	
711 - 1 V	AP-Precipitation-Filtration-Oxidation	
	AP-Oxalic mother liquors recovery	
	AP-Off gas treatment	
E-3	AP-Liquid waste reception	
E-3	AP-Dissolution	2.9
	AP-Dissolution of chlorinated feed	
	AP-Acid recovery	
	AP-Purification cycle	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	the effected equipment in AP Process Cell)	
	the effected equipment in AF Frocess Cent	
Loss of	A break or leakage of a raffinates tank in an AP	1. Corrosion of raffinates tank
Confinement /	Process Cell results in a breach of confinement,	2. Mechanical failure of
Dispersal of	and the dispersal of radiological materials.	raffinates tank
Nuclear Material	and the dispersal of factorogical materials.	Tallmates tank
Nuclear Material	Specific Location:	
Aqueous Polishing	Specific Exclusion.	
	AP-Acid recovery	
AP-42	AP-Purification cycle	
A1 -72	AP-Liquid Waste Reception	
	Al -Liquid Waste Acception	
	Mode: All	
E-3		
	Hazard Sources:	
	Padialogical Material (manipus investors in	
	Radiological Material (maximum inventory in raffinates tank in AP Process Cell)	
	rannates tank in AP Process Cett)	
Loss of	,	1 Tanana 11 . La company
Loss of	Excessive temperature (due to decay heat) of	1. Loss or blockage of HVAC
Confinement /	,	cooling system
Confinement / Dispersal of	Excessive temperature (due to decay heat) of PuO2 Buffer Storage Unit (powder storage area).	cooling system 2. Loss of power to HVAC
Confinement /	Excessive temperature (due to decay heat) of	cooling system
Confinement / Dispersal of	Excessive temperature (due to decay heat) of PuO2 Buffer Storage Unit (powder storage area).	cooling system 2. Loss of power to HVAC
Confinement / Dispersal of Nuclear Material	Excessive temperature (due to decay heat) of PuO2 Buffer Storage Unit (powder storage area). Specific Location:	cooling system 2. Loss of power to HVAC
Confinement / Dispersal of Nuclear Material Aqueous Polishing	Excessive temperature (due to decay heat) of PuO2 Buffer Storage Unit (powder storage area). Specific Location: AP-Pre-Polishing Milling Storage Mode: All	cooling system 2. Loss of power to HVAC
Confinement / Dispersal of Nuclear Material Aqueous Polishing	Excessive temperature (due to decay heat) of PuO2 Buffer Storage Unit (powder storage area). Specific Location: AP-Pre-Polishing Milling Storage	cooling system 2. Loss of power to HVAC
Confinement / Dispersal of Nuclear Material Aqueous Polishing AP-46	Excessive temperature (due to decay heat) of PuO2 Buffer Storage Unit (powder storage area). Specific Location: AP-Pre-Polishing Milling Storage Mode: All Hazard Sources:	cooling system 2. Loss of power to HVAC
Confinement / Dispersal of Nuclear Material Aqueous Polishing	Excessive temperature (due to decay heat) of PuO2 Buffer Storage Unit (powder storage area). Specific Location: AP-Pre-Polishing Milling Storage Mode: All	cooling system 2. Loss of power to HVAC

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Unmitigated Event Description/Specific	
Location/Hazard Sources	Cause
Location Mazard Sources	
<u>.</u>	
Back-flow from AP vessels, tanks and piping	1. Loss of liquid flow through
	the supply line and failure of
	pipes and valves
of confinement (i.e., leakage into an interfacing	
system) and dispersal of radiological materials.	
Specific Location:	
AP-Precipitation-Filtration-Oxidation	
	23
AP-Liquid waste reception	
AP-Dissolution	
AP-Dissolution of chlorinated feed	
AP-Uranium Dissolution	
AP-Acid recovery	
AP-Sampling	
Mode: All	
Hazard Sources:	
Radiological Material (maximum inventory in AP vessel, tank or piping)	
Rack-flow from AP vessels tanks and nining	1. Loss of gas or liquid flow
	through the supply line and
	failure of pipes and valves
	·
	·
Specific Location:	
AP-Reagents	
AP-Solvent recovery	
AP-Oxalic mother liquors recovery	
AP-Off gas treatment	!
AP-Liquid waste reception	l
AP-Dissolution	
AP-Uranium Dissolution	
AP-Acid recovery	
AP-Purification cycle	
Mode: All	
Hazard Sources:	
	Back-flow from AP vessels, tanks and piping through a liquid supply line (e.g., steam or condensate lines, acid recovery line, hot water lines) to an interfacing system results in a breach of confinement (i.e., leakage into an interfacing system) and dispersal of radiological materials. Specific Location: AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Off gas treatment AP-Liquid waste reception AP-Dissolution AP-Dissolution of chlorinated feed AP-Uranium Dissolution AP-Sampling Mode: All Hazard Sources: Radiological Material (maximum inventory in AP vessel, tank or piping) Back-flow from AP vessels, tanks and piping through a reagent supply line to an interfacing system followed by the opening of this interfacing system (during operation or maintenance) results in a breach of confinement and dispersal of radiological materials to areas where workers might be present. Specific Location: AP-Reagents AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Oxalic mother liquors recovery AP-Precipitation-Filtration-Oxidation AP-Dissolution AP-Dissolution AP-Dissolution AP-Dissolution AP-Dissolution AP-Dissolution AP-Dissolution AP-Dissolution AP-Purification cycle Mode: All

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
or Location/ Event Number		
Loss of	A loss of exhaust flow involving the Off-Gas	1. Loss of normal electrical
Confinement /	Process Confinement System for AP vessels,	power
Dispersal of	tanks and piping results in degraded performance	2. Mechanical failure of off-
Nuclear Material	of the off-gas system (affecting both AP process cells and AP gloveboxes).	gas exhaust fans
Aqueous Polishing		
AP-21	Specific Location:	
	AP-Solvent recovery	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
E-3	AP-Oxalic mother liquors recovery	a ,
	AP-Off gas treatment	•
	AP-Liquid waste reception	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	"
	AP-Acid recovery	
	AP-Purification cycle	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	single AP vessel)	
Loss of	Internal Flood due to a leak or rupture of cooling	1. Corrosive chemicals
Confinement /	water pipes to an AP electrolyzer results in	interact with cooling water
Dispersal of	breach of the AP electrolyzer glovebox and the	piping
Nuclear Material	dispersal of radiological materials.	
Aqueous Polishing	Specific Location:	
AP-22	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
E-3	Mode: Normal Operation	
M ⁻ J	Hazard Sources:	
	Radiological Material (maximum inventory in AP Electrolyzer Glovebox)	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/		
Event Number		
Loss of	All Loss of Confinement / Dispersal of Nuclear	
Confinement /	Material events for MFFF-Gloveboxes apply to	
Dispersal of	Aqueous Polishing, as far as description and	
Nuclear Material	causes are concerned, and are bounding in terms	
	of consequences. (Refer to MFFF Gloveboxes	
Aqueous Polishing	Events GB-3 through GB-7 and GB-11)	
1	Specific Location:	
AP-23		
	AP-Acid recovery	
	AP-Solvent recovery	
	AP-PuO2 Decanning	
E-3	AP-Recanning	ta 9
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
9	AP-Dissolution	
1	AP-Dissolution of chlorinated feed	
and the second second	AP-Purification cycle	
	AP-Oxalic mother liquors recovery	'
1000	AP-Liquid Waste Reception	
·	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	ļ
	AP glovebox)	
	AI glovecox)	
Loss of	A leak outside of a glovebox in piping results in	1. Corrosive chemicals
Confinement /	a release of radioactive material inside a room	interact with piping
Dispersal of	with C-3 ventilation.	2. Mechanical failure of AP
Nuclear Material	Willi C-5 Velidianon.	piping.
Micical Material	Specific Location:	h-1
Aqueous Polishing	opecine Excanon.	
. sdacons i onsumi	AP-Precipitation-Filtration-Oxidation	
AP-50		
	Mode: Normal Operation	
	Hazard Sources:	
E-3	Radiological Material (maximum inventory in	
	single AP vessel)	1
	<u> </u>	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

		<u> </u>
Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
External Exposure	Oncome in involvements amount to amount	1 P
Aqueous Polishing	Operator is inadvertently exposed to excessive direct radiation in Aqueous Polishing resulting in excessive radiation exposure.	Exposure due to unintended radioactive material buildup Unplanned or unintended access to High Radiation Area
AP-24	Specific Location: Aqueous Polishing	3. Human error or equipment failure
	Aqueous Fonsing	
E-4	Mode: All	
	Hazard Sources:	
	Maximum Direct Radiation Source	***
Criticality	Re-configuration of fissile material potentially	1. Excessive quantity of fissile
0	results in nuclear criticality and the release of	material is accumulated in
Aqueous Polishing	radiological material.	process unit 2. Incorrect sample analysis
AP-25	Specific Location:	3. Inadvertent concentration of process solution
	Aqueous Polishing	4. Human error or equipment failure
E-5	Mode: All	5. Change in geometry of process unit
	Hazard Sources:	6. Internal flooding of process unit.
	Fissile and Radiological Material	
Load Handling	A break or leakage in AP vessels, tanks and piping within an AP Glovebox results in a	Human error or equipment failure during load handling
Aqueous Polishing	breach of confinement, and the dispersal of radiological materials.	operations inside a glovebox
AP-36	Specific Location:	
E-6	AP-Acid recovery AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle	
	AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in AP glovebox including inventory in AP vessels, tanks and piping)	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop or Location/ Event Number Load Handling Aqueous Polishing AP-26 AP-26 AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Pre-polishing AP-Pre-polishing AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Mode: All	cause
or Location/ Event Number Load Handling All Load Handling events for MFFF-Gloveboxes apply to Aqueous Polishing, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10) Specific Location: E-6 AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-Pre-polishing Milling AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	11. P
Event Number Load Handling All Load Handling events for MFFF-Gloveboxes apply to Aqueous Polishing, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10) Specific Location: E-6 AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	50. P
Aqueous Polishing Aqueous Polishing AP-26 AP-26 AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Pre-polishing Milling AP-Pre-polishing Milling AP-Pre-polishing Milling AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution AP-Dissolution of chlorinated feed AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	22.9
apply to Aqueous Polishing, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10) Specific Location: E-6 AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	22.9
Aqueous Polishing AP-26 and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10) Specific Location: E-6 AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-PuO2 Canning AP-Puo3 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	22.9
terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10) Specific Location: E-6 AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-PuO2 Canning AP-Puo3 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	in 9
AP-26 Gloveboxes Events GB-8 through GB-10) Specific Location: E-6 AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	9
Specific Location: AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	3
E-6 AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	32. 3
AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	21.9
AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	52. 9
AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	in V
AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	11. 3
AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	a. •
AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	
AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	
AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	
AP-Dissolution of chlorinated feed AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	
AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	
AP-Oxalic mother liquors recovery AP-Liquid Waste Reception	
AP-Liquid Waste Reception	
Mode: All	
1	
Hazard Sources:	
Radiological Material (maximum inventory in glovebox)	
giovedox)	
Load Handling A Load Handling event involving miscellaneous 1. Human en	ror or equipment
	g maintenance
Aqueous Polishing piping within an AP Process Cell results in a activities	P manifestation
dispersal of radiological materials.	
AP-27	
Specific Location:	
AP-Solvent recovery	
E-6 AP-Precipitation-Filtration-Oxidation	
AP-Oxalic mother liquors recovery	
AP-Off gas treatment	
AP-Liquid waste reception	
AP-Dissolution	
AP-Dissolution of chlorinated feed	
AP-Acid recovery	
AP-Purification cycle	
Mode: All	
Hazard Sources:	
Radiological Material (maximum inventory in	
AP Process Cell – dissolution - including	
inventory in AP vessels, tanks and piping)	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/ Event Number		
Load Handling	A Load Handling event involving miscellaneous	1. Human error or equipment
A sussus Balishins	load handling devices and a raffinates tank in an	failure during maintenance
Aqueous Polishing	AP Process Cell results in a dispersal of radiological materials.	activities
AP-43		
•	Specific Location:	:
	AP-Acid recovery	
E-6	AP-Purification cycle	
	AP-Liquid Waste Reception	
	Mode: All	22.5
	Hazard Sources:	:
	Radiological Material (maximum inventory in	
	raffinates tank in AP Process Cell)	
Chemical	A chemical release due to fire in a C2 Area	1. Ignition of combustible
Aqueous Polishing	(e.g., Reagents rooms) involving flammable or reactive chemicals in AP vessels, tanks and	material by electrical equipment (e.g., spark)
	piping results in a chemical release with	2. Incorrect reagent addition
AP-28	potential impact on the worker and on control	and subsequent reaction
	area habitability.	3. Other causes for ignition
E-7	Specific Location:	
	•	
	AP-Reagents	
	Mode: All	:
	Hazard Sources:	
	Hazardous Chemicals	
Chemical	A break or leakage in AP vessels, tanks and	1. Mechanical failure of AP
Aqueous Polishing	piping in C2 Areas results in a chemical release with potential impact on the worker and on	vessels, tanks and piping 2. Corrosive failure of AP
	control area habitability.	vessels, tanks and piping
AP-30		
	Specific Location:	
E-7	AP-Reagents	
	Mode: All	
	Hazard Sources:	
	Hazardous Chemicals	

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
	A loss of tank venting in AP vessels, tanks and	1. Mechanical failure of
Chemical	piping in C2 Areas results in a chemical release	ventilation system
	piping in C2 Areas results in a chemical release	ventuation system
Aqueous Polishing	with potential impact on the worker and on	
	control area habitability.	,
AP-31	·	
		į.
	Specific Location:	
E-7	AP-Reagents	
	· -	
	Mode: All	
	Hazard Sources:	~~ *
•	Hazardous Chemicals	·
Chemical	Excessive temperature (due to chemical reaction)	1. Incorrect reagent addition
Chemicai	involving AP vessels, tanks and piping in C2	
A Deliabina	Areas results in a chemical release with potential	
Aqueous Polishing	Areas results in a chemical release with potential	
1 1_	impact on the worker and on control area	
AP-32	habitability.	
į.		
	Specific Location:	
E-7	AP-Reagents	
	Mode: Normal Operation, Startup	
	Hazard Sources:	
	Hazardous Chemicals	ľ
Chemical	Pressure higher than the design pressure of tank	1. Pressurizing chemical
	venting in AP vessels, tanks and piping in C2	reaction
Aqueous Polishing	Areas results in a chemical release with potential	2. Pressurizing steam injection
	impact on the worker and on control area	1
AP-33	habitability.	
	Specific Location:	1
E-7	AP-Reagents	1
E-1	TI -Wageins	1
	Made: Normal Operation Startus	
	Mode: Normal Operation, Startup	1
	Hazard Sources:	Į.
i	l	
1	Hazardous Chemicals	
1		

Table 5A-2. Unmitigated Events, Aqueous Polishing (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Chemical Aqueous Polishing AP-45	A break or leakage in AP vessels, tanks and piping results in a release of chemical byproducts.	Mechanical failure of AP vessels, tanks and piping. Corrosive failure of AP vessels, tanks and piping.
Ar-43	Specific Location: Aqueous Polishing	
E-7	Mode: All Hazard Sources: Chemical by-products	24.70
External Events	See external events at the end of the hazard evaluation table.	
AP-34		
E-8		
Natural Phenomena	See natural phenomena events at the end of the hazard evaluation table.	
AP-35		
E-9		

Table 5A-3. Unmitigated Events, Receiving Workshop

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire MFFF-Receiving Workshop RC-1	Fire (due to transient combustibles, electrical equipment, etc.) affects C2 Storage Area (powder storage area) and results in an energetic breach of powder cans and dispersal of radiological materials from the powder storage area.	I. Ignition of transient combustible material Combustibles and unknown ignition source
E-1	Specific Location: PuO2 3013 Storage Unit PuO2 Receiving Unit Mode: All Hazard Sources:	\$4. \$
	Radiological Material (maximum inventory in powder storage area)	·
Internal Fire MFFF-Receiving Workshop RC-2	Fire (due to transient combustibles, electrical equipment, etc.) affects UO2 Receiving or Storage Area (powder storage area) and results in an energetic breach of UO2 drum and dispersal of radiological materials from the powder storage area.	Ignition of transient combustible material Combustibles and unknown ignition source
E-1	Specific Location: UO2 Receiving Unit UO2 Storage Unit Mode: All	
	Hazard Sources: Radiological Material (maximum inventory in UO2 drum)	

Table 5A-3. Unmitigated Events, Receiving Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire MFFF-Receiving Workshop RC-3	A fire in the truck bay (e.g., fuel fire) involving transport packages results in an energetic breach of the containers (transport packages) and the dispersal of radiological materials.	I. Ignition of combustible material due to electrical short Combustibles and unknown ignition source
E-1	Specific Location: PuO2 Receiving Unit, Truck Bay Mode: All	u v
	Hazard Sources: Radiological Material (maximum inventory in transport packages and maximum number of packages)	
Internal Fire MFFF-Receiving Workshop RC-16	A container of contaminated or radioactive material (i.e., a waste drum) fails or is involved in a fire and results in breach of the container and the dispersal of radiological materials.	Ignition of combustible material due to electrical short Combustibles and unknown ignition source
E-1	Specific Location: PuO2 Receiving Unit-Truck Bay Mode: Normal Operation	
	Hazard Sources: Radiological Material (maximum inventory in container)	

Table 5A-3. Unmitigated Events, Receiving Workshop (continued)

Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Number Internal Fire MFFF- Receiving Workshop RC-4 E-1	All Internal Fire events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-1 and GB-2) Specific Location: PuO2 Buffer Storage Unit UO2 Drum Emptying Unit Mode: All	
	Hazard Sources: Radiological Material (maximum inventory in glovebox)	
Loss of Confinement / Dispersal of Nuclear Material	Excessive temperature (due to decay heat) of C2 Storage Area (powder storage area).	Loss or blockage of HVAC cooling system Loss of power to HVAC cooling system
MFFF-Receiving Workshop RC-5	Specific Location: PuO2 3013 Storage Unit Mode: All	
E-3	Hazard Sources: Radiological Material (maximum inventory in powder storage area)	

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Table 5A-3. Unmitigated Events, Receiving Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Excessive temperature (due to decay heat) of PuO2 Buffer Storage Unit (powder storage area).	Loss or blockage of HVAC cooling system Loss of power to HVAC cooling system
MFFF-Receiving Workshop RC-6	Specific Location: PuO2 Buffer Storage Unit Mode: All Hazard Sources: Radiological Material (maximum inventory in buffer storage unit)	32. 9
Loss of Confinement / Dispersal of Nuclear Material MFFF- Receiving Workshop RC-8 E-3	All Loss of Confinement / Dispersal of Nuclear Material events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-3 through GB-7 and GB-11) Specific Location: PuO2 Buffer Storage Unit UO2 Drum Emptying Unit Mode: All Hazard Sources: Radiological Material (maximum inventory in glovebox)	

Table 5A-3. Unmitigated Events, Receiving Workshop (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	ì
or Location/ Event	'	· .
Number		
External Exposure	Operator is inadvertently exposed to excessive	1. Exposure due to
· ·	direct radiation in the MFFF Receiving	unintended radioactive
MFFF-Receiving	Workshop resulting in excessive radiation	material buildup
Workshop	exposure.	2. Unplanned or unintended
		access to High Radiation
RC-9	Specific Location:	Area
I RC-5	bpecine Because.	3. Human error or equipment
	PuO2 Receiving Unit	failure
	PuO2 3013 Storage Unit	lanuic
]		ľ
E-4	PuO2 Buffer Storage Unit	
·	PuO2 Receiving Unit-Truck Bay	
	UO2 Receiving Unit	24.9
	UO2 Storage Unit	
	UO2 Drum Emptying Unit	
	Mode: All	
	Hazard Sources:	
	Maximum Direct Radiation Source	
Criticality	Re-configuration of fissile material potentially	1. Excessive quantity of
	results in nuclear criticality and the release of	fissile material is
MFFF-Receiving	radiological material.	accumulated in process unit
Workshop		2. Improper placement of
Workshop	Specific Location:	fissile material outside of
RC-10	Specific Exemion.	criticality safe storage
KC-10	PuO2 Receiving Unit	locations
	PuO2 3013 Storage Unit	3. Human error or equipment
1		failure
1	PuO2 Buffer Storage Unit	4. Introduction of moderator
E-5	PuO2 Receiving Unit-Truck Bay	(e.g., internal flooding of
	Mode: All	process unit)
	Hazard Sources:	
	Fissile and Radiological Material	

Table 5A-3. Unmitigated Events, Receiving Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Receiving Workshop	Inadvertent opening or damage to the inner can of a 3013 storage can, while opening the 3013 storage can, resulting in the breach of the inner can and the dispersal of radiological materials.	Human error or equipment failure
RC-7	Specific Location: PuO2 Receiving Unit	
E-6	PuO2 3013 Storage Unit Mode: Normal Operation	u,
	Hazard Sources: Radiological Material (maximum inventory in 3013 container in a glovebox)	
Load Handling MFFF-Receiving Workshop RC-11	A UO2 drum fails or is damaged, while being handled by miscellaneous load handling devices, resulting in a breach of the drum and the dispersal of radiological materials contained in the drum.	Human error or equipment failure during load handling operations
E-6	Specific Location: UO2 Receiving Unit UO2 Storage Unit	
;	Mode: All	
	Hazard Sources: Radiological Material (maximum inventory in UO2 drum)	

Table 5A-3. Unmitigated Events, Receiving Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Receiving Workshop RC-12	The drop of a radioactive material container (i.e., a 3013 can) onto another radioactive material container (i.e., another 3013 can) while utilizing hoisting equipment results in a breach of the container, and the dispersal of radiological material. Specific Location:	Human error or equipment failure during hoisting operations
E-6	PuO2 Receiving Unit PuO2 3013 Storage Unit Mode: All Hazard Sources: Radiological Material (maximum inventory in two 3013 containers in C2 Area)	34.7
Load Handling MFFF-Receiving Workshop RC-13	A load drop onto a radioactive material container (i.e., a 3013 can) while utilizing hoisting equipment results in a breach of the container, and the dispersal of radiological material. Specific Location:	Human error or equipment failure during hoisting operations
E-6	PuO2 Receiving Unit PuO2 3013 Storage Unit Mode: All Hazard Sources:	
	Radiological Material (maximum inventory in 3013 container(s))	

Table 5A-3. Unmitigated Events, Receiving Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Receiving Workshop RC-17	The drop of a radioactive material container (i.e., a 3013 transport package) onto another radioactive material container (i.e., another 3013 transport package) or onto the floor while utilizing hoisting equipment results in a breach of the package, and the dispersal of radiological material. Specific Location:	Human error or equipment failure during hoisting operations
E-6	PuO2 Receiving Unit PuO2 3013 Storage Unit Mode: All Hazard Sources: Radiological Material (maximum inventory in two 3013 packages in C2 Area)	21.7
Load Handling MFFF-Receiving Workshop RC-15	A container of contaminated or radioactive material (i.e., a waste drum) fails or is damaged while being handled by miscellaneous handling devices and results in breach of the container and the dispersal of radiological materials.	Human error or equipment failure during waste drum handling operations
E-6	Specific Location: PuO2 Receiving Unit PuO2 Receiving Unit-Truck Bay Mode: Normal Operation	
	Hazard Sources: Radiological Material (maximum inventory in container)	

Table 5A-3. Unmitigated Events, Receiving Workshop (continued)

5	T	C
Event	Unmitigated Event Description/Specific	Cause
Type/Workshop	Location/Hazard Sources	
or Location/ Event	and the state of t	
Number		
Load Handling	All Load Handling events for MFFF-Gloveboxes	
	apply to this workshop, as far as description and	
MFFF-Receiving	causes are concerned, and are bounding in terms	
Workshop	of consequences. (Refer to MFFF Gloveboxes	
-	Events GB-8 through GB-10)	
RC-14	·	
	Specific Location:	
	PuO2 Buffer Storage Unit	
E-6	UO2 Drum Emptying Unit	
	Mode: All	
		u s
	Hazard Sources:	
	Badialaria Mataial (manimum imantam in	
	Radiological Material (maximum inventory in glovebox)	
	i i	î .

Table 5A-4. Unmitigated Events, Powder Workshop

1		<u> </u>
Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Number		
Internal Fire	All Internal Fire events for MFFF-Gloveboxes	
	apply to this workshop, as far as description and	
MFFF-Powder	causes are concerned, and are bounding in terms	
Workshop	of consequences. (Refer to MFFF Gloveboxes	
DII. 4	Events GB-1 and GB-2)	
PW-1	Specific Location:	
	Proce Container Opening & Heading Unit	
E-1	PuO2 Container Opening & Handling Unit Jar Storage and Handling	
L-1	Primary Dosing Unit	
	Final Dosing Unit	24.4
	Powder Auxiliary	
	Scrap (Powder) Processing Unit	
	Ball Milling Units	
	Homogenization and Pelletizing Units	
	AP-Pre-polishing Milling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	glovebox)	
Loss of	All Loss of Confinement / Dispersal of Nuclear	
Confinement /	Material events for MFFF-Gloveboxes apply to	
Dispersal of Nuclear	this workshop, as far as description and causes	
Material	are concerned, and are bounding in terms of	
	consequences. (Refer to MFFF Gloveboxes	
MFFF-Powder	Events GB-3 through GB-7 and GB-11)	
Workshop		
PW-2	Specific Location:	
. ***-	PuO2 Container Opening & Handling Unit	
	Jar Storage and Handling	
	Primary Dosing Unit	
E-3	Final Dosing Unit	
	Powder Auxiliary	
	Scrap (Powder) Processing Unit	
	Ball Milling Units	
	Homogenization and Pelletizing Units	
	AP-Pre-polishing Milling	
	Mode: All	
	Hazard Sources:	
	Badialasiaal Manadal (manimum inneres)	
	Radiological Material (maximum inventory in glovebox)	

Table 5A-4. Unmitigated Events, Powder Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
External Exposure MFFF-Powder	Operator is inadvertently exposed to excessive direct radiation in the MFFF-Powder Workshop resulting in excessive radiation exposure.	Exposure due to unintended radioactive material buildup
Workshop PW-3	Specific Location:	2. Human error or equipment failure
	PuO2 Container Opening & Handling Unit Jar Storage and Handling Primary Dosing Unit	
E-4	Final Dosing Unit Powder Auxiliary Scrap (Powder) Processing Unit	219
	Ball Milling Units Homogenization and Pelletizing Units AP-Pre-polishing Milling	
	Mode: All	
	Hazard Sources:	
	Maximum Direct Radiation Source	
Criticality	Re-configuration of fissile material potentially results in nuclear criticality and the release of	Excessive quantity of fissile material is
MFFF-Powder Workshop	radiological material. Specific Location:	accumulated in process unit 2. Improper placement of fissile material outside of
PW-4	PuO2 Container Opening & Handling Unit	criticality safe storage locations
	Jar Storage and Handling Primary Dosing Unit	3. Human error or equipment failure
E-5	Final Dosing Unit Powder Auxiliary Scrap (Powder) Processing Unit	4. Introduction of moderator (e.g., internal flooding of process unit)
	Ball Milling Units Homogenization and Pelletizing Units AP-Pre-polishing Milling	
	Mode: All	
	Hazard Sources:	
	Fissile and Radiological Material	

Table 5A-4. Unmitigated Events, Powder Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Powder Workshop PW-5	All Load Handling events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10) Specific Location:	
E-6	PuO2 Container Opening & Handling Unit Jar Storage and Handling Primary Dosing Unit Final Dosing Unit Powder Auxiliary Scrap (Powder) Processing Unit Ball Milling Units Homogenization and Pelletizing Units AP-Pre-polishing Milling Mode: All	22.9
·	Hazard Sources: Radiological Material (maximum inventory in glovebox)	·

Table 5A-5. Unmitigated Events, Pellet Workshop

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	Cause
Location/ Event	Location Hazar & Sources	
Number		
Internal Fire	All Internal Fire events for MFFF-Gloveboxes	
Internal rue	apply to this workshop, as far as description and	
MERCE Dallas	causes are concerned, and are bounding in terms	
MFFF-Pellet]
Workshop	of consequences. (Refer to MFFF Gloveboxes	
	Events GB-1 and GB-2)	
PT-1	Caralfa I anniam.	
	Specific Location:	ļ
	Pellet Inspection and Sorting Units	
E-1	Ground and Sorted Pellet Storage	
E-1		
	Green Pellet Storage	±.*
	Sintering Furnaces	
	Sintered Pellet Storage	
	Scrap Pellet Storage	ł .
	Quality Control and Manual Sorting	
	Scrap Box Loading	
	Pellets Handling	
	Grinding Units	
, _	Pellets Repackaging	
	Mode: All	
		
	Hazard Sources:	
	B. 3. 1 136	
	Radiological Material (maximum inventory in	1
	glovebox)	<u> </u>
Internal Fire	A fire in Pellet Storage involving MP Glovebox	1. Ignition of combustible
internal fue		material due to electrical
ACTOR Dallas	combustibles (e.g., electrical equipment, and	short
MFFF-Pellet	transient combustibles) results in an energetic	2. Combustibles and
Workshop	breach of Pellet Storage and the dispersal of	
707.0	radiological materials.	unknown ignition source
PT-2		:
	Specific Location:	
	Specific Location.	
E-1	Green Pellet Storage	Į.
E-1	Sintered Pellet Storage	1
	1	
	Ground and Sorted Pellet Storage	
	Scrap Pellet Storage	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in MP Glovebox: Pellet Storage)	

Table 5A-5. Unmitigated Events, Pellet Workshop (continued)

Event Type/Workshop or	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Location/ Event Number		
Internal Fire	A fire involving MP Glovebox combustibles and ignition sources (e.g., transient combustibles and	I. Ignition of combustible material due to electrical
MFFF-Pellet Workshop	grinding or laser equipment) results in an energetic breach of the MP Glovebox and the	short 2. Ignition of combustibles
PT-3	dispersal of radiological materials.	during grinding operations 3. Combustibles and unknown ignition source
	Specific Location:	,
E-1	Grinding Units	ta.
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in MP glovebox)	·
Explosion	Hydrogen and oxygen buildup in a sintering furnace or in the sintering furnace room results	Excessive hydrogen introduced to furnace
MFFF-Pellet	in a hydrogen explosion, an energetic breach of	2. Hydrogen accumulation in
Workshop	the sintering furnace confinement, and the dispersal of radiological materials.	room or in adjoining furnace entry/exit or cooling
PT-4		gloveboxes (hydrogen leak) 3. Oxygen leaks into furnace
	Specific Location:	or airlocks 4. Improper mixing of
E-2	Sintering Furnaces	hydrogen in C4 exhaust
	Facility Wide (pipes)	stream.
	Mode: Normal Operation, Startup	
	Hazard Sources:	
	Radiological Material (maximum inventory in Sintering Furnace)	

Table 5A-5. Unmitigated Events, Pellet Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	All Loss of Confinement / Dispersal of Nuclear Material events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes	
MFFF-Pellet Workshop	Events GB-3 through GB-7 and GB-11)	
PT-5	Specific Location:	
	Pellet Inspection and Sorting Units Ground and Sorted Pellet Storage Green Pellet Storage	. 229
E-3	Sintering Furnaces Sintered Pellet Storage Scrap Pellet Storage Quality Control and Manual Sorting Scrap Box Loading Pellets Handling Grinding Units Pellets Repackaging	
	Mode: All Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	
Loss of Confinement / Dispersal of Nuclear Material MFFF-Pellet Workshop	Sintering Furnace seal failure or overpressurization (e.g. excessive pressurization by hydrogen/argon line) affects the Sintering Furnace(s) and results in a breach of the Sintering Furnace(s) confinement, and the dispersal of radiological materials.	Failure of control system for hydrogen/argon supply line Sintering Furnace exhaust system failure Sintering Furnace seal leakage
PT-6	Specific Location:	
E-3	Sintering Furnaces Mode: Normal Operation, Startup	
	Hazard Sources:	
	Radiological Material (maximum inventory in both Sintering Furnaces)	

Table 5A-5. Unmitigated Events, Pellet Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Excessive temperature of Sintering Furnace(s) results in high temperature damage to and breach of the Sintering Furnace(s), the furnace entry/exit air locks, or the connecting gloveboxes.	Control system failure Loss of cooling
MFFF-Pellet Workshop	Specific Location:	
PT-7	Sintering Furnaces	
	Mode: Normal Operation	
E-3	Hazard Sources:	29
	Radiological Material (maximum inventory in a single Sintering Furnace)	
External Exposure	Operator is inadvertently exposed to excessive direct radiation in the MFFF-Pellet Workshop	Exposure due to unintended radioactive
MFFF-Pellet Workshop	resulting in excessive radiation exposure.	material buildup 2. Unplanned or unintended
PT-8	Specific Location:	access to High Radiation
F1-0	Pellet Inspection and Sorting Units Ground and Sorted Pellet Storage Green Pellet Storage	3. Human error or equipment failure
E-4	Sintering Furnaces Sintered Pellet Storage Scrap Pellet Storage	
	Quality Control and Manual Sorting	
	Scrap Box Loading Pellets Handling	
	Grinding Units	
	Pellets Repackaging	
	Mode: All	
	Hazard Sources:	
	Maximum Direct Radiation Source	

Table 5A-5. Unmitigated Events, Pellet Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Criticality	Re-configuration of fissile material potentially results in nuclear criticality and the release of	Excessive quantity of fissile material is
MFFF-Pellet Workshop PT-9	radiological material. Specific Location:	accumulated in process unit 2. Improper placement of fissile material outside of criticality safe storage
	Pellet Inspection and Sorting Units Ground and Sorted Pellet Storage Green Pellet Storage	locations 3. Human error or equipment failure
E-5	Sintering Furnaces Sintered Pellet Storage Scrap Pellet Storage Quality Control and Manual Sorting Scrap Box Loading Pellets Handling Grinding Units Pellets Repackaging Mode: All	4. Introduction of moderator (e.g., internal flooding of process unit)
	Hazard Sources: Fissile and Radiological Material	
Load Handling	A Load Handling Event involving miscellaneous load handling devices within the MP Glovebox	Human error or equipment failure during load handling
MFFF-Pellet Workshop	Area surrounding the Sintering Furnace results in a breach of the Sintering Furnace, the furnace entry/exit air locks, or the connecting	operations around the furnace
PT-10	gloveboxes, and the dispersal of radiological materials.	
E-6	Specific Location: Sintering Furnaces	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in Sintering Furnace)	

Table 5A-5. Unmitigated Events, Pellet Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling	All Load Handling events for MFFF-Gloveboxes apply to this workshop, as far as description and	
MFFF-Pellet Workshop	causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes	
PT-11	Events GB-8 through GB-10)	
	Specific Location:	
E-6	Pellet Inspection and Sorting Units Ground and Sorted Pellet Storage Green Pellet Storage Sintering Furnaces Sintered Pellet Storage Scrap Pellet Storage Quality Control and Manual Sorting Scrap Box Loading Pellets Handling Grinding Units	21. 9
	Pellets Repackaging Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	
Explosion MFFF-Pellet Workshop	Water entry in to the sintering furnace from the sintering furnace humidifier results in a steam explosion, an energetic breach of the sintering furnace confinement, and the dispersal of radiological materials.	Humidifier level controller failure
PT-12	Cassific I costion.	
E-2	Specific Location: Sintering Furnaces Facility Wide (pipes)	
	Mode: Normal Operation, Startup	
	Hazard Sources:	
	Radiological Material (maximum inventory in Sintering Furnace)	

Table 5A-5. Unmitigated Events, Pellet Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Sintering Furnace gases from the normally pressurized sintering furnace leak into the process room due to a breach in the furnace confinement barrier.	Furnace seal failure
MFFF-Pellet Workshop PT-13	Specific Location:	
E-3	Sintering Furnaces Mode: Normal Operation, Hazard Sources:	*
:	Radiological Material (maximum inventory in Sintering Furnace)	

Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop

Event	Unmitigated Event Description/Specific	C
Type/Workshop or	Location/Hazard Sources	Cause
Location/ Event	Location Hazai & Soul CES	į.
Number		
Internal Fire	Fire (due to electrical equipment, transient	1 Ignition of combustible
million 1 HC	combustibles, etc.) affects C2 Area (fuel rods) and	Ignition of combustible material due to electrical
MFFF-Cladding and	results in an energetic breach of fuel rod confinement	
Rod Control	and dispersal of radiological materials.	short
Workshop	and dispersal of fadiological materials.	2. Combustibles and
Workshop	Specific Location:	unknown ignition source
RD-1	Specific Excation.	
ND-1	Rod Storage	
	X-ray Inspection Unit	
	Helium Leak Test	
E-1	Rod Scanning	,
E-1	Rod Scanning Rod Tray Handling	ta 9
	Rod Tray Franching Rod Tray Loading	
	Rod Inspection and Sorting	
	Rod hispection and Sorting	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in rods)	
Internal Fire	All Internal Fire events for MFFF-Gloveboxes apply	
	to this workshop, as far as description and causes are	
MFFF-Cladding and	concerned, and are bounding in terms of	
Rod Control	consequences. (Refer to MFFF Gloveboxes Events	
Workshop	GB-1 and GB-2)	
	35 1 and 35-2)	
RD-2	Specific Location:	
	Rod Cladding and Decontamination	
	Rod De-cladding Unit	
E-1	The second secon	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire MFFF-Cladding and Rod Control Workshop RD-3	A fire involving MP Glovebox combustibles (e.g., transient combustibles, welding equipment, isopropanol used in decontamination) results in an energetic breach of the MP Glovebox and the dispersal of radiological materials.	I. Ignition of combustible material due to electrical short Ignition of combustibles during welding operations Combustibles and unknown ignition source
E-1	Specific Location: Rod Cladding and Decontamination Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in MP glovebox)	- A.P
Loss of Confinement / Dispersal of Nuclear Material	Excessive temperature (due to decay heat) of C2 Storage Area (other than powder storage area) results in breach of fuel rod confinement.	Loss of normal ventilation system Loss of power
MFFF-Cladding and Rod Control Workshop	Specific Location: Rod Storage	
RD-4 E-3	Mode: All Hazard Sources: Radiological Material (maximum inventory in fuel rod storage area)	

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Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Leakage from fuel rods in C2 Areas results in breach of confinement, and dispersal of radiological materials.	Defective fuel rod(s)
MFFF-Cladding and Rod Control Workshop	Specific Location: X-Ray Inspection Unit	
RD-5	Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test	22. 3
E-3 ·	Rod Storage Rod Scanning Mode: All	
:	Hazard Sources:	
	Radiological Material (maximum inventory in fuel rod or rods)	
Loss of Confinement / Dispersal of Nuclear Material MFFF-Cladding and	All Loss of Confinement / Dispersal of Nuclear Material events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-3 through GB-7 and GB-11)	
Rod Control Workshop	Specific Location:	
RD-6	Rod Cladding and Decontamination Rod De-cladding Unit	
E-3	Mode: All Hazard Sources:	•
	Radiological Material (maximum inventory in glovebox)	

Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop (continued)

Type/Workshop or Location/Event Number Location/Event Number Location/Event Number Location/Event Number Location/Event Number Location/Event Number The fracture of one or multiple fuel rods while utilizing fuel rod handling equipment results in breach of confinement, and dispersal of radiological materials. MFFF-Cladding and Rod Control Workshop RD-11 Rod Tray Loading Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Loading Rod Tray Loading Rod Tray Loading Rod Tray Loading Rod Tray Loading Rod Tray Loading Rod Tray Loading Rod Tray Loading Rod Tray Loading Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources: Maximum Direct Radiation Source	Esta-4	Unmitigated Event Description/Specific	Cause
Location/ Event Number Loss of Confinement / Dispersal of Nuclear Material MFFF-Cladding and Rod Control Workshop RD-11 External Exposure MFFF-Cladding and Rod Control Workshop External Exposure MFFF-Cladding and Rod Control Workshop RD-7 RD-7 Rod Cladding and Rod Control Workshop RD-7 Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Inspection Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	Event Type/Workshop or		Cause
Number Loss of Confinement / Dispersal of Nuclear Material The fracture of one or multiple fuel rods while utilizing fuel rod handling equipment results in breach of confinement, and dispersal of radiological materials. Specific Location: X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) MFFF-Cladding and Rod Control Workshop Rod Control Workshop Specific Location: Rod Cladding and Rod Control Workshop Rod Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		Lacation/Hazai u Sources	
Loss of Confinement / Dispersal of Nuclear Material MFFF-Cladding and Rod Control Workshop RD-11 External Exposure MFFF-Cladding and Rod Control Workshop Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Scanning Rod Scanning Rod Scanning Rod Scanning Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:			
Confinement / Dispersal of Nuclear Material MFFF-Cladding and Rod Control Workshop RD-11 External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Iray Loading Rod De-cladding Unit Mode: All Hazard Sources:		The fracture of one or multiple fuel rods while	1. Human error or equipment
Dispersal of Nuclear Material MFFF-Cladding and Rod Control Workshop RD-11 ROJ Tray Handling Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop RD-7 ROd Cladding and Decontamination X-Ray Inspection Unit Rod Tray Loading Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Iray Loading Rod Iray Loading Rod Scanning Rod Scanning Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		utilizing fuel rod handling equipment results in breach	
Material materials. MFFF-Cladding and Rod Control Workshop RD-11 RD-11 RD-11 RD-11 ROd Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Loading Rod Tray Load	4 4 4 4 4 5 1 1 1 1 1 1 1 1 1 1	of confinement, and dispersal of radiological	.*
MFFF-Cladding and Rod Control Workshop RD-11 ROD Tray Handling ROD Inspection Unit Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Loading Rod Inspection unit Rod Tray Loading Rod Tray Loading Rod Inspection unit Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	•		
Rod Control Workshop X-Ray Inspection Unit Rod Tray Handling Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Scanning Rod Inspection and Sorting Helium Leak Test Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	171001101		
Rod Control Workshop X-Ray Inspection Unit Rod Tray Handling Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Scanning Rod Inspection and Sorting Helium Leak Test Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	MFFF-Cladding and	Specific Location:	
RD-11 Rod Tray Loading Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	_		
RD-11 Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	Workshop	X-Ray Inspection Unit	
Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop resulting in excessive radiation exposure. RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	•	Rod Tray Handling	
External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Helium Leak Test Rod Storage Rod Storage Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop resulting in excessive radiation exposure. Specific Location: RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	RD-11	Rod Tray Loading	
Rod Storage Rod Scanning Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Rod Control Workshop Exulting in excessive radiation exposure. RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod De-cladding Unit Mode: All Hazard Sources:		Rod Inspection and Sorting	ಬಾ
External Exposure MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Loading Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		Helium Leak Test	1
Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure Operator is inadvertently exposed to excessive direct radiation in the MFFF-Cladding and Rod Control Workshop resulting in excessive radiation exposure. Specific Location: RD-7 Rod Cladding and Decontamination XRay Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		Rod Storage	
Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Control Workshop resulting in excessive radiation exposure. RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	E-3	Rod Scanning	;
Hazard Sources: Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure MFFF-Cladding and Control Workshop resulting in excessive radiation exposure. RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:			
Radiological Material (maximum inventory in fuel rod or fuel rods) External Exposure Operator is inadvertently exposed to excessive direct radiation in the MFFF-Cladding and Rod Control Workshop resulting in excessive radiation exposure. Specific Location: RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		Mode: Normal Operation	
External Exposure MFFF-Cladding and Rod Control Workshop Specific Location: RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		Hazard Sources:	
External Exposure MFFF-Cladding and Rod Control Workshop Specific Location: RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		Dediclosical Material (maximum inventory in final	
External Exposure MFFF-Cladding and Rod Control MFFF-Cladding and Rod Control Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:			
MFFF-Cladding and Rod Control Workshop resulting in excessive radiation exposure. RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Inspection and Sorting Helium Leak Test Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:			
MFFF-Cladding and Rod Control Workshop resulting in excessive radiation exposure. RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Inspection and Sorting Helium Leak Test Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	External Exposure	Operator is inadvertently exposed to excessive direct	1. Human error or equipment
MFFF-Cladding and Rod Control Workshop Workshop RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:			
Rod Control Workshop Specific Location: RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	MFFF-Cladding and		2. Unplanned or unintended
Workshop Specific Location: RD-7 Rod Cladding and Decontamination X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		14.4	exposure to x-rays
X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	Workshop	Specific Location:	
X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	RD-7	Rod Cladding and Decontamination	
Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		X-Ray Inspection Unit	
E-4 Rod Inspection and Sorting Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		Rod Tray Handling	
Helium Leak Test Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:		Rod Tray Loading	·
Rod Storage Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	E-4		·
Rod Scanning Rod De-cladding Unit Mode: All Hazard Sources:	j	Helium Leak Test	
Rod De-cladding Unit Mode: All Hazard Sources:	1		
Mode: All Hazard Sources:			
Hazard Sources:		Rod De-cladding Unit	
		Mode: All	
Maximum Direct Radiation Source		Hazard Sources:	
		Maximum Direct Radiation Source	

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Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event	•	İ
Number		
Criticality	Re-configuration of fissile material potentially results	1. Excessive quantity of
	in nuclear criticality and the release of radiological	fissile material is
MFFF-Cladding and	material.	accumulated in process unit
Rod Control		2. Improper placement of
Workshop	Specific Location:	fissile material outside of criticality safe storage
RD-8	Rod Cladding and Decontamination	locations
ND-0	X-Ray Inspection Unit	3. Introduction of moderator
	Rod Tray Handling	(e.g., internal flooding of
	Rod Tray Loading	process unit)
E-5	Rod Inspection and Sorting	4. Human error or equipment
2-3	Helium Leak Test	failure
	Rod Storage	l mine
	Rod Scanning	
	Rod De-cladding Unit	ì
	Rod De-Clauding Chit	
	Mode: All	
	Hazard Sources:	
	Fissile and Radiological Material	
Load Handling	The drop of a heavy load onto fuel rods while	1. Human error or equipment
	utilizing miscellaneous load handling devices results	failure
MFFF-Cladding and	in breach of confinement, and dispersal of	
Rod Control	radiological materials.	
Workshop		
•	Specific Location:	
RD-9		
	X-Ray Inspection Unit	
	Rod Tray Handling	1
	Rod Tray Loading	
E-6	Rod Inspection and Sorting	
	Helium Leak Test	
	Rod Storage	
	Rod Scanning	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in fuel rod or rods)	

Table 5A-6. Unmitigated Events, Cladding and Rod Control Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Cladding and Rod Control Workshop	The drop of fuel rods onto the floor while utilizing hoisting equipment results in breach of confinement, and dispersal of radiological materials. Specific Location:	Human error or equipment failure
RD-10	X-Ray Inspection Unit Rod Tray Handling Rod Tray Loading Rod Inspection and Sorting	
E-6	Helium Leak Test Rod Storage Rod Scanning Mode: Normal Operation	21.9
	Hazard Sources: Radiological Material (maximum inventory of rod tray)	
Load Handling MFFF-Cladding and Rod Control Workshop	All Load Handling events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10)	
RD-12	Specific Location:	
E-6	Rod Cladding and Decontamination Rod De-cladding Unit Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

Table 5A-7. Unmitigated Events, Assembly Workshop

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire	Fire (due to electrical equipment, transient combustibles, etc.) affects C2 Area (assemblies) and	Ignition of combustible material due to electrical
MFFF-Assembly	results in an energetic breach of fuel rod confinement	short
Workshop	and dispersal of radiological materials from the	2. Combustibles and
AS-1	assembly storage areas.	unknown ignition source
A5-1	Specific Location:	
	Assembly Packaging	
E-1	Assembly Mockup Loading	
	Assembly Handling and Storage	ಜ . ೪
	Assembly Mounting Unit	
	Assembly Dry Cleaning	
	Assembly Dimensional Inspection	
	Assembly Final Inspection	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in assembly storage area)	
Internal Fire	Fire (due to ignition of pyrophoric zircaloy chips or	1. Ignition of pyrophoric
	shavings) affects C2 Area (assemblies) and results in	material
MFFF-Assembly	an energetic breach of fuel rod confinement and	
Workshop	dispersal of radiological materials from the assembly	
	dry cleaning unit.	
AS-2	Specific Location:	
	Assembly Dry Cleaning	
E-1		
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory of fuel assembly)	_

Table 5A-7. Unmitigated Events, Assembly Workshop (continued)

Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Number Internal Fire MFFF-Assembly Workshop	Fire (due to electrical equipment, transient combustibles, etc.) affects Fuel Assembly Truck Bay and results in an energetic breach of fuel assemblies in shipping cask(s) and dispersal of radiological materials from the truck bay.	Ignition of combustible material due to electrical short Combustibles and unknown ignition source
AS-11 E-1	Specific Location: Assembly Packaging (Truck Bay) Mode: All Hazard Sources:	21.9
	Radiological Material (maximum inventory in shipping package(s))	
Internal Fire MFFF-Assembly Workshop AS-13	A container of contaminated or radioactive material (i.e., a waste drum) is involved in a fire and results in breach of the container and the dispersal of radiological materials.	I. Ignition of combustible material due to electrical short Combustibles and unknown ignition source
E-1	Specific Location: Assembly Packaging (Truck Bay) Mode: All	
	Hazard Sources: Radiological Material (maximum inventory in container)	
Loss of Confinement / Dispersal of Nuclear Material	Excessive temperature (due to decay heat) of C2 Storage Area (other than powder storage area) results in breach of fuel rod confinement.	Loss of normal ventilation system Loss of power
MFFF-Assembly Workshop AS-3	Specific Location: Assembly Handling and Storage Mode: All	
E-3	Hazard Sources: Radiological Material (maximum inventory in fuel rod or rods)	

Table 5A-7. Unmitigated Events, Assembly Workshop (continued)

Event Type/Workshop or	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Location/ Event Number		
Loss of Confinement / Dispersal of Nuclear	The fracture of multiple fuel rods while utilizing assembly handling equipment results in breach of confinement, and dispersal of radiological materials.	Human error or equipment failure
Material	Specific Location:	
MFFF-Assembly Workshop	Assembly Mockup Loading Assembly Mounting Unit	
AS-10		
	Mode: Normal Operation	ia 9
E-3	Hazard Sources:	
	Radiological Material (maximum inventory in multiple fuel rods)	
Loss of Confinement / Dispersal of Nuclear Material	Leakage from fuel rods in C2 Areas results in breach of confinement, and dispersal of radiological materials.	1. Defective Fuel rod(s)
MFFF-Assembly Workshop	Specific Location:	
AS-4	Assembly Packaging Assembly Mockup Loading Assembly Handling and Storage	
E-3	Assembly Mounting Unit Assembly Dry Cleaning Assembly Dimensional Inspection Assembly Final Inspection	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in fuel rod or rods)	

Table 5A-7. Unmitigated Events, Assembly Workshop (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
External Exposure	Operator is inadvertently exposed to excessive direct	1. Human error or equipment
•	radiation in the MFFF-Rod/Assembly Workshop	failure
MFFF-Assembly	resulting in excessive radiation exposure.	
Workshop		
	Specific Location:	
AS-5		
	Assembly Packaging	
	Assembly Mockup Loading	
E-4	Assembly Mockup Loading Assembly Handling and Storage	
E-4		1
	Assembly Mounting Unit	1
	Assembly Dry Cleaning	51.79
	Assembly Dimensional Inspection	į
	Assembly Final Inspection	
	Mode: All	
1	Hazard Sources:	
		ļ
	Maximum Direct Radiation Source	
Criticality	Re-configuration of fissile material potentially results	1. Excessive quantity of
	in nuclear criticality and the release of radiological	fissile material is
MFFF-Assembly	material.	accumulated in process unit
Workshop		2. Improper placement of
	Specific Location:	fissile material outside of
AS-6		criticality safe storage
	Assembly Packaging	locations
Ī	Assembly Mockup Loading	3. Introduction of moderator
	Assembly Handling and Storage	(e.g., internal flooding of
E-5	Assembly Mounting Unit	process unit)
	Assembly Dry Cleaning	4. Human error or equipment
	Assembly Dimensional Inspection	failure
	Assembly Final Inspection	
	Mode: All	
	11000	
	Hazard Sources:	
	Fissile and Radiological Material	
	Fissile and Radiological Material	

Table 5A-7. Unmitigated Events, Assembly Workshop (continued)

Event	TI-mistans 3 Times Times 1 at 125 at	
Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling	A suspended fuel assembly in motion impacts an object or another assembly while utilizing a crane or	Human error or equipment failure
MFFF-Assembly Workshop	hoisting equipment and results in breach of confinement, and dispersal of radiological materials.	raiture
AS-7	Specific Location:	
E-6	Assembly Handling and Storage Assembly Dry Cleaning Assembly Dimensional Inspection	
	Mode: Normal Operation	23
	Hazard Sources:	
	Radiological Material (maximum inventory of two fuel assemblies)	
Load Handling	The drop of a heavy load onto an assembly or	1. Human error or equipment
MFFF-Assembly Workshop	assemblies while utilizing miscellaneous load handling devices results in breach of confinement, and dispersal of radiological materials.	failure
AS-8	Specific Location:	
E-6	Assembly Packaging Assembly Mockup Loading Assembly Handling and Storage Assembly Mounting Unit Assembly Dry Cleaning Assembly Dimensional Inspection Assembly Final Inspection	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory of fuel assembly or assemblies)	

Table 5A-7. Unmitigated Events, Assembly Workshop (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		•
Number		
Load Handling	The drop of an assembly onto the floor or onto	Human error or equipment
	another assembly while utilizing hoisting equipment	failure
MFFF-Assembly	results in breach of confinement, and dispersal of	
Workshop	radiological materials.	
AS-9	Specific Location:	
	Assembly Packaging	
	Assembly Mockup Loading	
E-6	Assembly Handling and Storage	
	Assembly Mounting Unit	
	Assembly Dry Cleaning	
	Assembly Dimensional Inspection	u.s
	Assembly Final Inspection	,
		·
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory of two fuel assemblies)	
Load Handling	A container of contaminated or radioactive material	1. Human error or equipment
Load Halloring	(i.e., a waste drum) fails or is damaged while being	failure during waste drum
MFFF-Assembly	handled by miscellaneous handling devices and	handling operations
Workshop	results in breach of the container and the dispersal of	nationing operations
Workshop	•	ļ
40 10	radiological materials.	
AS-12		Į.
	Specific Location:	
E-6	A seembly Bookseing (Truck Boy)	
	Assembly Packaging (Truck Bay)	
	Mode: Normal Operation	
	Hazard Sources:	
	Harma boules.	1
:	Radiological Material (maximum inventory in container)	
L	<u> </u>	<u> </u>

Table 5A-7. Unmitigated Events, Assembly Workshop (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling MFFF-Assembly Workshop	The drop of an assembly transport package onto the floor while utilizing hoisting equipment results in breach of confinement, and dispersal of radiological materials.	Human error or equipment failure
AS-14	Specific Location:	
E-6	Assembly Packaging Assembly Packaging (Truck Bay) Mode: Normal Operation	
	Hazard Sources:	20
	Radiological Material (maximum inventory of one fuel assembly transport package)	

Table 5A-8. Unmitigated Events, Waste Handling

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire	Waste containers are involved in a fire and are	1. Combustibles and
	damaged while being handled outside a glovebox,	electrical short
Waste Handling	which results in the dispersal of radiological materials.	2. Combustion of waste from exposure to chemicals
WH-1	,	3. Ignition of Zircaloy swarf waste
	Specific Location:	4. Combustibles and unknown ignition source
E-1	Waste storage areas	
	Waste Nuclear Counting	ļ
	Maintenance and	2.0
	Mechanical Dismantling	
	Filter Dismantling	
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in waste containers)	1
Internal Fire	All Internal Fire events for MFFF-Gloveboxes apply	
	to this workshop, as far as description and causes are	
Waste Handling	concerned, and are bounding in terms of	İ
114000 1141011118	consequences. (Refer to MFFF Gloveboxes Events	
WH-2	GB-1 and GB-2)	
	Specific Location:	
E-1	Maintenance and	
1 2 1	Mechanical Dismantling	
1	Filter Dismantling	İ
	The Dishanding	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

Table 5A-8. Unmitigated Events, Waste Handling (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion Waste Handling WH-3 E-2	Radiolysis induced hydrogen accumulation in a waste container involving radioactive materials with hydrocarbons results in a hydrogen explosion with impact on the worker and on control area habitability. Specific Location: Waste storage areas Waste Nuclear Counting Maintenance and Mechanical Dismantling Filter Dismantling Mode: All Hazard Sources: Radiological Material (maximum inventory in a waste container)	1. Presence of organic and radioactive material in container
Loss of Confinement / Dispersal of Nuclear Material	A waste container fails or is damaged while being handled outside a glovebox and results in the dispersal of radiological materials.	Human error or equipment failure
Waste Handling WH-4	Specific Location: Waste storage areas	
E-3	Waste Nuclear Counting Maintenance and Mechanical Dismantling Filter Dismantling	
	Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in waste	
	container, e.g., filters)	

Table 5A-8. Unmitigated Events, Waste Handling (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material Waste Handling	All Loss of Confinement / Dispersal of Nuclear Material events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-3 through GB-7 and GB-11)	
WH-5	Specific Location: Maintenance and Mechanical Dismantling Filter Dismantling	33,9
	Mode: All Hazard Sources: Radiological Material (maximum inventory in glovebox)	·
External Exposure Waste Handling	Operator is inadvertently exposed to excessive direct radiation in the MFFF-Waste Handling resulting in excessive radiation exposure.	Exposure due to unintended radioactive material buildup
WH-6	Specific Location:	2. Human error or equipment failure
E-4	Waste storage areas Waste Nuclear Counting Maintenance and Mechanical Dismantling Filter Dismantling	
	Mode: All	·
	Hazard Sources:	
	Maximum Direct Radiation Source	

Table 5A-8. Unmitigated Events, Waste Handling (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	İ
Location/ Event		
Number		
Criticality	Re-configuration of fissile material potentially results	1. Excessive quantity of
	in nuclear criticality and the release of radiological	fissile material is
Waste Handling	material.	accumulated in process unit
		2. Improper placement of
WH-7	Specific Location:	fissile material outside of
İ		criticality safe storage
	Waste storage areas	locations
	Waste Nuclear Counting	3. Introduction of moderator
E-5	Maintenance and	(e.g., internal flooding of
	Mechanical Dismantling	process unit)
	Filter Dismantling	4. Human error or equipment
	· · · · · · · · · · · · · · · · · · ·	failure
	Mode: All	3.3
	Hazard Sources:	
	Fissile and Radiological Material	
Load Handling	A dropped waste drum or waste disposal bag fails or	1. Human error or
	is damaged, while being handled by miscellaneous	equipment failure during
Waste Handling	load handling devices, resulting in a breach of the	load handling operations
	drum and the dispersal of radiological materials	operations
WH-8	contained in the drum.	
·	Specific Location:	
E-6		
	Waste storage areas	
	Waste Nuclear Counting	
	Maintenance and	
	Mechanical Dismantling	
	Filter Dismantling	
	Mode: All	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in waste container)	

Table 5A-8. Unmitigated Events, Waste Handling (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling Waste Handling WH-9	All Load Handling events for MFFF-Gloveboxes apply to this workshop, as far as description and causes are concerned, and are bounding in terms of consequences. (Refer to MFFF Gloveboxes Events GB-8 through GB-10)	
	Specific Location:	•
E-6	Maintenance and Mechanical Dismantling Filter Dismantling	
	Mode: All	2.9
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

Table 5A-9. Unmitigated Events, Miscellaneous Areas

Event Type/Workshop or	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Location/ Event Number	Locations Hazar & Sources	
Internal Fire MFFF- Miscellaneous	A fire involving combustibles and ignition sources (e.g., transient combustibles, solvents, flammable gases, and electrical equipment, plasma torches, evaporators, furnaces, heating plates) in a laboratory	Combustibles and electrical short Combustion of waste from exposure to chemicals
Areas) MA-1	with a Glovebox results in an energetic breach of the Glovebox and the dispersal of radiological materials.	Maintenance activities Multiple ignition sources
	Specific Location:	
E-1	Laboratories	2.9
	Mode: Normal Operation	
	Hazard Sources:	
	Radiological Material (maximum inventory in laboratory glovebox)	
Internal Fire	A fire in a C2 Area involving combustibles (e.g., electrical equipment, transient combustibles, HEPA filter) results in a breach of a container of	Combustibles and electrical short
Miscellaneous Areas MA-2	contaminated or radioactive material (i.e., a transfer container) and the dispersal of radiological materials.	Combustion of waste from exposure to chemicals Maintenance activities Combustibles and
WM-2	Specific Location:	unknown ignition source
E-1	AP-Liquid Waste Reception MFFF-Air locks, corridors, stairways, and safe areas	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in container)	

Table 5A-9. Unmitigated Events, Miscellaneous Areas (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	Cause
Location/ Event	pocation man a bout oco	
Number		·
Internal Fire	A fire in a C2 Area involving combustibles (e.g.,	1. Combustibles and
	electrical equipment, transient combustibles, HEPA	electrical short
MFFF-	filter) results in a breach of a container of	2. Combustion of waste from
Miscellaneous Areas	contaminated or radioactive material (i.e., a waste	exposure to chemicals
	drum) and the dispersal of radiological materials.	3. Maintenance activities
MA-12		4. Combustibles and
		unknown ignition source
	Specific Location:	·
,		
E-1	AP-Liquid Waste Reception	
	MFFF-Air locks, corridors, stairways, and safe	2,9
	havens	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	container)	
Internal Fire	A fire (due to electrical equipment, transient	1. Combustibles and
	combustibles, etc.) affecting miscellaneous areas	electrical short
MFFF-	(e.g., air locks, corridors, stairs, etc.) in a C2 area	2. Maintenance activities
Miscellaneous Areas	results in fire damage but no safety related impact.	3. Combustibles and
1,	·	unknown ignition source
MA-3	Specific Location:	
	Specific Location.	·
	MFFF-Air locks, corridors, stairways, and safe areas	
E-1	MFFF-Storage Areas (non-waste)	1
	MFFF-Offices and personal access areas	
,		1
	Mode: All	
	Hazard Sources:	
	None	
the state of the s		

Table 5A-9. Unmitigated Events, Miscellaneous Areas (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		l .
Number		
Explosion	An explosion in a laboratory involving flammable,	1. Leak or spill of
l	explosive, or reactive chemicals (e.g., organics or	flammable liquids or gasses
MFFF-	explosive gases) results in the dispersal of	2. Chemical reaction
Miscellaneous Areas	radiological material.	releases explosive gasses
1		
MA-4		1
	Specific Location:]
ŀ		
l	Laboratories	l
E-2		
	Mode: All	
		3.7
	l	
	Hazard Sources:	1
	I mark to the second of the se	
	Radiological Material (maximum inventory in	
	laboratory)	
Loss of		
Confinement /	A container of contaminated or radioactive material	1. Human error or equipment
	(i.e., a transfer container or a 3013 container) fails or	failure during container
Dispersal of Nuclear	is damaged while being handled by miscellaneous	handling operations
Material	handling devices in a C2 Area and results in breach of	
Vece	the container and the dispersal of radiological	
MFFF- Miscellaneous Areas	materials.	
Miscellaneous Areas	Sacrific I continue	1
MA-5	Specific Location:	
MA-3	AD Timil West December	
	AP-Liquid Waste Reception	
	MFFF-Airlocks, corridors, and stairways	1
E-3	Mode: Normal Operation	İ
	Wode. Normal Operation	
	Hazard Sources:	ļ.
		1
	Radiological Material (maximum inventory in	
	container)	
		Į.
Loss of	Corrosion of a laboratory glovebox by corrosive	1. Corrosive chemicals
Confinement /	chemicals results in a breach (i.e., material failure) of	interact with glovebox
Dispersal of Nuclear	glovebox confinement and dispersal of radiological	leading to failure
Material	materials.	leading to fairthe
MFFF-	Specific Location:	
Miscellaneous Areas	•	
	Laboratories	
MA-6		
	Mode: All	
	Hazard Sources:	ļ į
E-3		
	Radiological Material (maximum inventory in	}
	laboratory glovebox)	İ

Table 5A-9. Unmitigated Events, Miscellaneous Areas (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
External Exposure MFFF- Miscellaneous Areas MA-7 E-4	Operator is inadvertently exposed to excessive direct radiation in the MFFF-Miscellaneous Areas resulting in excessive radiation exposure. Specific Location: Laboratories Mode: All Hazard Sources: Maximum Direct Radiation Source	Exposure due to unintended radioactive material buildup Human error or equipment failure
Criticality MFFF- Miscellaneous Areas MA-8 E-5	Re-configuration of fissile material potentially results in nuclear criticality and the release of radiological material. Specific Location: Laboratories Mode: All Hazard Sources: Fissile and Radiological Material	1. Excessive quantity of fissile material is accumulated in process unit 2. Improper placement of fissile material outside of criticality safe storage locations 3. Introduction of moderator (e.g., internal flooding of process unit) 4. Human error or equipment failure
Load Handling MFFF- Miscellaneous Areas MA-11 E-6	A container of contaminated or radioactive material (i.e., a waste drum) fails or is damaged while being handled by miscellaneous handling devices in a C2 Area and results in breach of the container and the dispersal of radiological materials. Specific Location: AP-Liquid Waste Reception MFFF-Airlocks, corridors, and stairways Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in container)	Human error or equipment failure during waste drum handling operations

Table 5A-9. Unmitigated Events, Miscellaneous Areas (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Chemical MFFF- Miscellaneous Areas MA-9	A fire affects the Additives Preparation Area and results in toxic chemicals being released from the chemical containers with potential impact on the worker and on control area habitability. Specific Location:	Combustibles and electrical short Combustion of waste from exposure to chemicals Maintenance activities Combustibles and unknown ignition source
E-7	MFFF-Additives Preparation Area Mode: All Hazard Sources: Hazardous Chemicals	23.79
MFFF- Miscellaneous Areas MA-10	A breach of hazardous chemical containers in the Additives Preparation Area results in a chemical release with potential impact on the worker and on control area habitability. Specific Location:	Human error or equipment failure Corrosion of containers Drop of container(s)
E-7	MFFF-Additives Preparation Area Facility Wide Mode: All Hazard Sources: Hazardous Chemicals	

Table 5A-10. Unmitigated Events, Support Facilities Outside MFFF

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	·
Location/ Event	The second secon	
Number		
Internal Fire	A fire (involving diesel fuel storage, gas storage	1. Combustibles and
	platform, the Reagents Processing Building, etc.)	electrical short
Support Facilities	occurs and affects the MFFF Building resulting in	2. Combustion of waste from
Outside MFFF	structural damage.	exposure to chemicals
		3. Maintenance activities
SF-1	Specific Location:	4. Combustibles and
		unknown ignition source
•	General Plant and Outside Areas	
•	Reagents Processing Building	
E-1	Gas Storage Facility	
*	Emergency Diesel Generator Building	
	Standby Diesel Generator Building	
	Secured Warehouse Building	
	Access Control Building	
	Administration Building	
	Technical Support Building	
		·
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF	
	susceptible to the consequences of external fires or	
	explosions)	
·	CAPICAL CONTRACTOR OF THE CAPICAL CONTRACTOR	
Internal Fire	A fire (involving electrical equipment, transient	Combustibles and
	combustibles, etc.) affects UO2 drums outside the	electrical short
Support Facilities	AP/MP Building (e.g., in the Secured Warehouse	2. Combustibles and
Outside MFFF	Building) and results in a breach of confinement and	unknown ignition source
	the dispersal of radiological materials.	•
SF-2		·
	Specific Location:	
	General Plant and Outside Areas	ľ
E-1	Secured Warehouse Building	Ì
	_	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory of UO2 in	
	Secured Warehouse Building)	
	Scotton waterouse purious,	

Table 5A-10. Unmitigated Events, Support Facilities Outside MFFF (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion Support Facilities Outside MFFF SF-3	An explosion at a nearby support facility (e.g., diesel fuel storage, gas storage platform, the Reagents Processing Building, nearby MFFF support facility on the MFFF site) outside the MFFF Building results in structural damage to the MFFF. Specific Location:	1. Fuel oil or gas leak combined with electrical short or Combustibles and unknown ignition source 2. Unintended interaction of chemicals which are explosively incompatible 3. Human error or equipment
E-2	General Plant and Outside Areas Reagents Processing Building Gas Storage Facility Emergency Diesel Generator Building Standby Diesel Generator Building Access Control Building (Armory) Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to disruption by structural damage)	failure
Loss of Confinement / Dispersal of Nuclear Material Support Facilities Outside MFFF	A leak or break in an underground waste pipeline outside MFFF results in a breach of confinement, and the dispersal of radiological materials. Specific Location:	Mechanical failure of piping Corrosion induced failure of piping Human error results in pipe break
SF-14	General Plant and Outside Areas Mode: All	
E-3	Hazard Sources: Radiological Material (maximum inventory of waste tank)	

Table 5A-10. Unmitigated Events, Support Facilities Outside MFFF (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling Support Facilities Outside MFFF SF-13	A handling accident, a fire or natural phenomena affects UO2 drums outside the AP/MP Building (e.g., in the Secured Warehouse Building) and results in a breach of confinement and the dispersal of radiological materials. Specific Location:	Human error or equipment failure during load handling operations Combustibles and electrical short Combustibles and unknown ignition source
E-6	General Plant and Outside Areas Secured Warehouse Building Mode: All Hazard Sources: Radiological Material (maximum inventory of UO2 in Secured Warehouse Building)	3 . \$
Chemical Support Facilities Outside MFFF SF-4	A diesel fuel oil leak from a diesel fuel tank or associated piping results in a chemical release with potential impact on the worker and on control area habitability. Specific Location:	Mechanical failure of fuel tank Inadvertent puncture of fuel tank
E-7	Emergency Diesel Generator Building Standby Diesel Generator Building Mode: All Hazard Sources:	
	Hazardous Chemicals	

Table 5A-10. Unmitigated Events, Support Facilities Outside MFFF (continued)

Location/Hazard Sources	
A loss of ventilation in the Reagents Processing	1. Loss of all normal control
	systems
	2. Loss of power
	3. Mechanical failure of
the worker and control area habitability.	ventilation system
Specific Location:	
Pagante Processing Ruilding	
weakents trocessing panionia	53,19
Mode: All	
Hazard Sources:	
Hazardous Chemicals	
Extreme weather affects the Reagents Processing	1. Extreme weather
habitability.	
Specific Location:	
D 111	
Reagents Processing Building	
Mode: All	
Hazard Sources:	
Hazardous Chemicals	
	Hazard Sources: Hazardous Chemicals Extreme weather affects the Reagents Processing Building and results in toxic chemicals being released from the vessels, tanks, and piping in the building and potentially impacting the worker and control area habitability. Specific Location: Reagents Processing Building Mode: All Hazard Sources:

Table 5A-10. Unmitigated Events, Support Facilities Outside MFFF (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Chemical Support Facilities Outside MFFF SF-8	An external or internal impact affects the Reagents Processing Building and results in toxic chemicals being released from the vessels, tanks, and piping in the building and potentially impacting the worker and control area habitability.	1. Human error or equipment failure
E-7	Specific Location: Reagents Processing Building	. 3.7
	Mode: All Hazard Sources: Hazardous Chemicals	
Chemical Support Facilities Outside MFFF	A pipe break or leak from vessels, tanks, and piping in the Reagents Processing Building results in toxic chemicals being released from the vessels, tanks, and piping and potentially impacts the worker and control area habitability.	Mechanical failure of vessels, tanks, or piping
SF-11 E-7	Specific Location: Reagents Processing Building	
	Mode: All Hazard Sources:	
Chemical Support Facilities	Hazardous Chemicals A loss of tank venting in vessels, tanks and piping in the Reagents Processing Building results in a chemical release with potential impact on the worker	Mechanical failure of ventilation system
Outside MFFF SF-12	and on control area habitability. Specific Location:	
E-7	Reagents Processing Building Mode: All	
	Hazard Sources: Hazardous Chemicals	

Table 5A-11. Unmitigated Events, HVAC Systems

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		
Number		
Internal Fire	A fire in the C4 VHD System (i.e., C4 Dynamic	1. Combustibles and
	Confinement) disables the system or damages the	electrical short circuit
MFFF-HVAC	HEPA filters and results in a loss of negative pressure	2. Other causes for ignition
Systems	in the gloveboxes, breach of confinement, and	of combustible material
'	dispersal of radiological materials.	
HV-1	3	
	Specific Location:	
	AP-Acid recovery	
E-1	AP-Solvent recovery	
	AP-PuO2 Decanning	,
İ	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	
·	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	·
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in HEPA	
	filters and maximum inventory airborne in the	
	gloveboxes)	

Table 5A-11. Unmitigated Events, HVAC Systems (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire MFFF-HVAC Systems	A fire in the AP Process Offgas System disables the system or damages the HEPA filters and results in a loss of negative pressure in the AP pipes and vessels, breach of confinement, and dispersal of radiological materials.	Combustibles and electrical short circuit Other causes for ignition of combustible material
HV-17	Specific Location:	
E-1	AP-Acid recovery AP-Solvent recovery AP-Precipitation-Filtration-Oxidation AP-Dissolution AP-Dissolution of chlorinated feed AP-Uranium Dissolution AP-Purification cycle AP-Oxalic mother liquors recovery AP-Liquid waste reception AP-Off gas treatment AP-Reagents	\$3. * \$
	Mode: All Hazard Sources:	
	Radiological Material (maximum inventory in HEPA filters and maximum inventory airborne in the AP pipes and vessels)	

Table 5A-11. Unmitigated Events, HVAC Systems (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	1
Location/ Event		
Number	+ 6 · · · · · · · · · · · · · · · · · ·	
Internal Fire	A fire in the C3 HVAC System (i.e., C3 Dynamic	1. Combustibles and
	Confinement), the C2 HVAC System, or the Process	electrical short circuit
MFFF-HVAC	Cell Ventilation System involving electrical	2. Other causes for ignition
Systems	equipment disables the system or damages the HEPA	of combustible material
	filters and results in a breach of confinement, and	ĺ
HV-2	dispersal of radiological materials.	
	Specific Location:	
E-1	AP-Acid recovery	
	AP-Solvent recovery	1
	AP-PuO2 Decanning	2.9
	AP-Recanning)
	AP-Pre-polishing Milling	i
:	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	i
•	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Uranium Dissolution	
	AP-Purification cycle	į
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Process Off-Gas Treatment	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
l	Miscellaneous Areas (Laboratories)	
·	Mode: All	
	Hazard Sources:	,
	Radiological Material (maximum inventory in C3 HVAC System)	

Table 5A-11. Unmitigated Events, HVAC Systems (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	A loss of negative pressure or a flow perturbation involving the C3 Dynamic Confinement results in a ventilation air flow reversal into a C2 Area. Specific Location:	Loss of all normal control systems Loss of power Mechanical failure of ventilation system
MFFF-HVAC Systems	AP-Acid recovery AP-Solvent recovery	
HV-3	AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning	
E-3	AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Uranium Dissolution AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories)	
	Hazard Sources:	
	Radiological Material	

Table 5A-11. Unmitigated Events, HVAC Systems (continued)

Event Type/Workshop or	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Location/ Event		i .
Number	3	
Loss of Confinement / Dispersal of Nuclear Material	A loss of negative pressure or a flow perturbation involving the Process Cells HVAC results in a ventilation air flow reversal into a C2 Area.	Loss of all normal control systems Loss of power Mechanical failure of
MFFF-HVAC	Specific Location:	ventilation system
Systems	AP-Solvent recovery AP-Oxalic mother liquors recovery	
HV-4	AP-Off gas treatment AP-Liquid waste reception	
	AP-Dissolution AP-Dissolution of chlorinated feed	
E-3	AP-Acid recovery AP-Purification cycle	3.9
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum airborne inventory in AP Process Cell not including inventory in AP vessels, tanks and piping)	

Table 5A-11. Unmitigated Events, HVAC Systems (continued)

A loss of negative pressure or a flow perturbation involving the C4 Dynamic Confinement results in a ventilation air flow reversal into a C3 Area. Specific Location:	Loss of normal control system Loss of all power Mechanical failure of ventilation system
AP-Acid recovery AP-Solvent recovery	
AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning	
AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Uranium Dissolution AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Mode: All Hazard Sources: Radiological Material (maximum airborne inventory	
	AP-PuO2 Decanning AP-Recanning AP-Recanning AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Uranium Dissolution AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Mode: All Hazard Sources:

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Table 5A-11. Unmitigated Events, HVAC Systems (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Back-flow from a glovebox room through a C3 ventilation system supply duct to another glovebox room results in a breach of C3 ventilation system confinement and cross contamination of MP and AP ventilation systems.	Loss of air flow through a C3 ventilation system supply duct
MFFF-HVAC Systems	Specific Location:	
HV-6	AP-Acid recovery	
E-3	AP-Solvent recovery AP-PuO2 Decanning AP-PuO2 Canning AP-Recanning AP-Recanning AP-Pre-polishing Milling	<i>77.</i> 9
	AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed	
	AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery Receiving Workshop	
	Powder Workshop Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories)	
	Mode: All	
	Hazard Sources: Radiological Material (maximum inventory in C3 area outside of gloveboxes)	·
Loss of Confinement / Dispersal of Nuclear Material	A loss of negative pressure or a flow perturbation involving the C2 Dynamic Confinement results in a ventilation air flow reversal into adjacent areas and contamination of those areas.	Loss of all normal control systems Loss of power Mechanical failure of ventilation system
MFFF-HVAC Systems	Specific Location:	
HV-10	AP-Reagents MFFF-Miscellaneous Areas Assembly Workshop	
E-3	Cladding and Rod Control Workshop Mode: All	
	Hazard Sources:	
	Radiological Material (maximum unconfined inventory in C2 Areas)	

Table 5A-11. Unmitigated Events, HVAC Systems (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Leakage from C3 Ventilation System, C2 Ventilation System, or Process Cell Ventilation Duct, facility wide, results in a breach of confinement, and the dispersal of radiological material.	Corrosion and penetration of ventilation duct
MFFF-HVAC Systems		
HV-11	Specific Location: HVAC, Facility Wide	
E-3	Mode: All	ii. V
	Hazard Sources:	
	Radiological Material (maximum inventory in C3 Ventilation System or Process Cell Ventilation Duct)	
Loss of Confinement / Dispersal of Nuclear Material	Leakage from C4 HVAC System or Process Offgas Ventilation Duct, facility wide, results in a breach of confinement, and the dispersal of radiological material.	Corrosion and penetration of ventilation duct
MFFF-HVAC Systems		
HV-12	Specific Location: HVAC, Facility Wide	
E-3	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in C4 Ventilation System or Process Cell Ventilation Duct)	

Table 5A-11. Unmitigated Events, HVAC Systems (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	Laux
Location/ Event Number		
Load Handling	A Load Handling Event involving miscellaneous load	Human error or
MFFF-HVAC	handling devices, which impact and penetrate the HVAC system and HEPA filter(s), results in a breach	equipment failure during
Systems	of confinement, and the dispersal of radiological	load handling operations around the HVAC system
HV-14	materials	,
HV-14		
	Specific Location:	
E-6	HVAC, Filter Rooms	
	Mode: All	25.9
	Hazard Sources:	
	Radiological Material contained in C4 HVAC system and filters	
Load Handling	A Load Handling Event involving miscellaneous load	1. Human error or
MFFF-HVAC	handling devices, which impacts the HVAC system, results in a bumped HEPA filter or HEPA filter(s), the	equipment failure during load handling operations
Systems	cascade of contamination through the HVAC system,	around the ventilation
HV-15	and the dispersal of radiological materials.	system
	Specific Location:	
E-6	HVAC, Filter Rooms	
	Mode: Long Shutdown	
	Hazard Sources:	
	Radiological Material contained in HVAC system and filters	
Chemical	A loss of ventilation air flow involving the C2 Dynamic Confinement System results in a chemical	1. Loss of all normal control
MFFF-HVAC	release with potential impact on the worker and on	systems 2. Loss of power
Systems	control area habitability.	3. Mechanical failure of
HV-16		ventilation system
	Specific Location:	
E-7	AP-Reagents MFFF-Miscellaneous Areas	
	Mode: All	
	Hazard Sources:	
	Hazardous Chemicals	

Table 5A-12. Unmitigated Events, Gloveboxes

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		Į
Number		<u> </u>
Internal Fire	A fire involving glovebox combustibles (e.g.,	1. Combustibles and
	electrical equipment, transient combustibles,	electrical short
MFFF-Gloveboxes	flammable liquids, HEPA filter) results in a breach of	2. Combustion of waste from
	the Glovebox and the dispersal of radiological	exposure to chemicals
GB-1	materials.	3. Ignition of flammable
		liquid (e.g., isopropanol used
**	Specific Location:	in rod cleaning)
		3. Maintenance activities
E-1	AP-Acid recovery	4. Combustibles and
	AP-Solvent recovery	unknown ignition source
	AP-PuO2 Decanning	5. Spontaneous heating of
	AP-Recanning	UO₂/PuO₂.
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	· ·
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	·
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	1
	Waste Handling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in a fire area)	

Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Internal Fire MFFF-Gloveboxes GB-2	A transfer container (containing contaminated process equipment or contaminated HEPA filters) is involved in a fire and is damaged while outside a glovebox and results in the dispersal of radiological materials.	Combustibles and electrical short Combustion of waste from exposure to chemicals Maintenance activities
E-1	AP-Acid recovery AP-Solvent recovery	4. Combustibles and unknown ignition source
	AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling	23.79
	AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution	
,	AP-Dissolution of chlorinated feed AP-Purification cycle AP-Sampling	
	AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop	
	Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories)	
	Waste Handling Mode: All	
	Hazard Sources: Radiological Material (maximum inventory in waste	
	container)	

Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material MFFF-Gloveboxes	Over-pressurization of the glovebox (i.e., C4 Dynamic Confinement) by rupture of a high flow or high pressure supply line or by HEPA filter clogging results in a ventilation air flow reversal into a C3 Area.	Rupture of a high flow or high pressure supply line Clogged outlet HEPA filter
GB-3	Specific Location:	
E-3	AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Recanning AP-Pre-polishing Milling AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pollet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Waste Handling Mode: All Hazard Sources: Radiological Material (maximum inventory in glovebox)	

Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Failure of a glove during normal operation or maintenance results in a breach of glovebox confinement and dispersal of radiological materials.	Human error results in glove failure during normal operation or maintenance Equipment failure
MFFF-Gloveboxes	Specific Location:	
GB-4	AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning	
E-3	AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling	· 33.
	AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle	
	AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop	
	Powder Workshop Pellet Workshop	
	Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Waste Handling	
	Mode: All	
	Hazard Sources:	
,	Radiological Material (maximum inventory in glovebox)	

 Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event		•
Number		
Loss of	Back-flow from glovebox through interfacing gas line	1. Loss of gas flow through
Confinement /	(e.g., nitrogen, helium) to interfacing system followed	the supply line
Dispersal of Nuclear	by the opening of this interfacing system (during	
Material	operation or maintenance) results in a breach of	
	glovebox primary confinement and dispersal of	
MFFF-Gloveboxes	radiological materials to areas where workers might	
	be present.	
GB-5	•	
	Specific Location:	
	AP-Acid recovery	
E-3	AP-Solvent recovery	
	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	
	AP-PuO2 Canning	l'
	AP-Precipitation-Filtration-Oxidation	•
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	1
	AP-Sampling	
	AP-Oxalic mother liquors recovery	
	AP-Liquid Waste Reception	
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	<u> </u>
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Waste Handling	

	Mode: All	
i	Hazard Sources:	
± .s	Radiological Material (maximum inventory in	
	glovebox)	

Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	Excessive temperature of process equipment inside a glovebox results in high temperature damage to and breach of the glovebox and the dispersal of radiological materials.	Failure of process control system Loss of cooling to process equipment
MFFF-Gloveboxes	Specific Location:	
GB-6	AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning	
E-3	AP-Pre-polishing Milling AP-PuO2 Canning AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Waste Handling Mode: All Hazard Sources: Radiological Material (maximum inventory in	23.9

Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	A plastic bag (containing contaminated process equipment or contaminated HEPA filters) fails or is damaged while being handled outside a glovebox and results in the dispersal of radiological materials.	Human error or equipment failure during load handling operations outside a glovebox
MFFF-Gloveboxes	Specific Location:	
GB-7	AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning	
E-3	AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Waste Handling	23.7
	Mode: All Hazard Sources:	
	Radiological Material (maximum inventory in waste container)	

Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material	A transfer container (containing contaminated process equipment or contaminated HEPA filters) fails or is damaged while being handled outside a glovebox and results in the dispersal of radiological materials.	Human error or equipment failure during load handling operations outside a glovebox
MFFF-Gloveboxes	Specific Location:	
GB-11	AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning	
E-3	AP-Pre-polishing Milling AP-PuO2 Canning AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Waste Handling Mode: All	23.7
	Hazard Sources: Radiological Material (maximum inventory in waste container)	

Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event Type/Workshop or Location/ Event	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Number	i i i i i i i i i i i i i i i i i i i	1. Human error or equipment
Load Handling	A container handling accident within a glovebox (e.g., a container impact with the glovebox) results in a	failure during load handling
MFFF-Gloveboxes	breach of the container and the glovebox, and the dispersal of radiological materials.	operations inside a glovebox
GB-8	•	
	Specific Location:	
	AP-Acid recovery	
E-6	AP-Solvent recovery	
	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	22.9
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	1
	AP-Homogenization-Sampling	
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	ł
	AP-Purification cycle	1
	AP-Sampling	
	AP-Oxalic mother liquors recovery	1
	Receiving Workshop	ļ
	Powder Workshop	
	Pellet Workshop	
	Cladding and Rod Control Workshop	
	Miscellaneous Areas (Laboratories)	
	Waste Handling	
	Mode: All	
	Hazard Sources:	
·	Radiological Material (maximum inventory in glovebox)	

Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling	A Load Handling Event involving miscellaneous load handling devices outside a glovebox results in a	Human error or equipment failure during load handling
MFFF-Gloveboxes	breach of the glovebox, and the dispersal of radiological materials.	operations outside a
GB-9		giovebox
E-6	AP-Acid recovery AP-Solvent recovery AP-PuO2 Decanning AP-Recanning AP-Pre-polishing Milling AP-Pre-polishing Milling AP-Precipitation-Filtration-Oxidation AP-Homogenization-Sampling AP-Dissolution AP-Dissolution of chlorinated feed AP-Purification cycle AP-Sampling AP-Oxalic mother liquors recovery AP-Liquid Waste Reception Receiving Workshop Powder Workshop Pellet Workshop Pellet Workshop Cladding and Rod Control Workshop Miscellaneous Areas (Laboratories) Waste Handling Mode: All Hazard Sources:	23.19
	Radiological Material (maximum inventory in glovebox)	

Table 5A-12. Unmitigated Events, Gloveboxes (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	
Location/ Event	e constitución de la constitució	
Number		
Load Handling	A container handling accident or container failure	1. Human error or equipment
	within a glovebox (i.e., a leak, break, or spill) results	failure during load handling
MFFF-Gloveboxes	in a breach of the container, and the dispersal of	operations inside a glovebox
	radiological materials within the glovebox.	
GB-10	Town to the second of the seco	
	Specific Location:	
	AP-Acid recovery	
E-6	AP-Solvent recovery	·
	AP-PuO2 Decanning	
	AP-Recanning	
	AP-Pre-polishing Milling	1
	AP-PuO2 Canning	
	AP-Precipitation-Filtration-Oxidation	
	AP-Homogenization-Sampling	1
	AP-Dissolution	
	AP-Dissolution of chlorinated feed	
	AP-Purification cycle	
	AP-Sampling	
	AP-Oxalic mother liquors recovery	i
	Receiving Workshop	
	Powder Workshop	
	Pellet Workshop	,
,	Cladding and Rod Control Workshop	
•	Miscellaneous Areas (Laboratories)	
	Waste Handling	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in glovebox)	

Table 5A-13. Unmitigated Events, Facility Wide

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	Cause
Location/ Event		
Number		[
Internal Fire	A facility wide fire (due to electrical equipment,	1. Combustibles and
	transient combustibles, etc.) involves the MFFF	electrical short
Facility Wide	Building and results in a breach of confinement, and	2. Combustion of waste from
	the dispersal of radiological material.	exposure to chemicals
FW-1		3. Maintenance activities
	Specific Location:	4. Combustibles and
		unknown ignition source
. .	All Process Units and Support Units with radioactive	
E-1	material present	
	Mode: All	
	Wiode. All	2.9
	Hazard Sources:	Ì
		·
	Radiological Material (maximum inventory in MFFF	
	susceptible to a facility wide fire)	
Internal Fire	A fire (due to electrical equipment, transient	1. Combustibles and
	combustibles, etc.) involves the Pneumatic Pipe	electrical short
Facility Wide	Automatic Transfer System and results in a breach of	2. Combustion of waste from
	confinement, and the dispersal of radiological	exposure to chemicals
FW-2	material.	3. Maintenance activities
		4. Combustibles and
		unknown ignition source
F-1	Specific Location:	
. .	openie zocajon.	
	Facility Wide (Two pneumatic transfer systems)	
	,,	
	Mode: All	
	·	
	Hazard Sources:	
	Padialasias Mataria (mari	
	Radiological Material (maximum inventory in Pneumatic Pipe Automatic Transfer System)	
	Theumane Tipe Automane Transfer System)	
	<u> </u>	

Table 5A-13. Unmitigated Events, Facility Wide (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Explosion Facility Wide FW-3	Pressure vessel or gas bottle failure, facility wide, results in explosive release and potential worker injury along with damage to process areas and confinement zones. Specific Location:	1. Pressure vessel overpressurization and pressure vessel located close to areas containing plutonium 2. Pressure vessel overpressurization and pressure vessel not in accordance with ASME Code 3. Pressure vessel overpressurization and pressure vessel relief not provided
E-2	All Process Units and Support Units with a pressure vessel or gas bottle and radioactive material present Mode: All Hazard Sources: Radiological Material (maximum inventory in nearby confinements)	
Explosion Facility Wide FW-4	An explosion due to flammable, explosive, or reactive chemicals in the contaminated drains, facility wide, results in a breach of confinement, and the dispersal of radiological material. Specific Location:	Explosive gas and unknown ignition source
E-2	All Process Units and Support Units with contaminated drains Mode: All Hazard Sources: Radiological Material (maximum inventory in contaminated drain)	

Table 5A-13. Unmitigated Events, Facility Wide (continued)

Propt	TI	
Event Type/Workshop or	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Location/ Event	Location Hazai u Soui ces	
Number		i ·
Explosion	Over-pressurization due to flammable, explosive, or	1. Over-pressurization due to
	reactive chemicals in the contaminated drains, facility	unanticipated chemical
Facility Wide	wide, results in a breach of confinement, and the	reaction
	dispersal of radiological material.	2. Human error or equipment
FW-6		failure
	Specific Location:	
E-2		
l ·	All Process Units and Support Units with	
	contaminated drains	
		23.9
	Mode: All	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	contaminated drain)	
Loss of	Leakage from contaminated drains, facility wide,	1. Corrosion of contaminated
Confinement /	results in a breach of confinement, and the dispersal	drains
Dispersal of Nuclear	of radiological material.	2. Mechanical failure of
Material		contaminated drains
P 111. 1211.1	Specific Location:	
Facility Wide	All Descent Heits and Comment Heits with	
FW-5	All Process Units and Support Units with contaminated drains	
LM-2	Contaminated drains	
	Mode: All	
	Mode. 7m	
E-3	Hazard Sources:	
	Radiological Material (maximum inventory in	
	contaminated drain)	
Loss of	Accident (e.g., Fire) leads to Radiation Air	1. Fire due to combustibles
Confinement /	Monitoring System HEPA filter failures (i.e., breach	and unknown ignition source
Dispersal of Nuclear	of C3 confinement) and spreads contamination	
Material	through the centralized air monitoring system.	
Facility Wide		
Tallity Wide	Specific Location:	
FW-7	openic Location.	
1	All Process Units and Support Units with radiation	
1	monitors associated with the centralized air	Ì
	monitoring system	
E-3		
	Mode: Normal Operation	
1]
	Hazard Sources:	
1		
1	Radiological Material (maximum inventory in C3	
	HVAC system)	
L	<u> </u>	L

Table 5A-13. Unmitigated Events, Facility Wide (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material Facility Wide	During normal operation, contamination spreads through the Radiation Air Monitoring System resulting in a breach of Secondary Confinement (i.e., leakage into an interfacing system) and dispersal of radiological materials.	Leak in Radiation Air Monitoring System
FW-8	Specific Location: All Process Units and Support Units with radiation monitors associated with the centralized air monitoring system	
E-3	Mode: Normal Operation Hazard Sources:	2.9
	Radiological Material (maximum inventory in a Secondary Confinement)	÷
Loss of Confinement / Dispersal of Nuclear Material	Over-pressurization or under-pressurization of the Pneumatic Pipe Automatic Transfer System due to improper operation of the Pneumatic Transfer Vacuum System results in a breach of confinement and dispersal of radiological materials.	1. Control system failure
Fw-9	Specific Location: Facility Wide (Two pneumatic transfer systems)	
E-3	Mode: Normal Operation Hazard Sources: Radiological Material (maximum inventory in	
	Pneumatic Pipe Automatic Transfer System)	
Loss of Confinement / Dispersal of Nuclear Material	Corrosion of the Pneumatic Pipe Automatic Transfer System due to corrosive chemicals results in a breach of confinement and dispersal of radiological materials.	1. Corrosion of the Pneumatic Pipe Automatic Transfer System
Facility Wide	Specific Location:	
	Facility Wide (Two pneumatic transfer systems)	
E-3	Mode: All Hazard Sources:	
	Radiological Material (maximum inventory in Pneumatic Pipe Automatic Transfer System)	

 Table 5A-13. Unmitigated Events, Facility Wide (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Loss of Confinement / Dispersal of Nuclear Material Facility Wide	Back-flow (from a support system outside a glovebox) through a liquid supply line (e.g., Chilled Water or Cooling Water) to Secondary Confinement, facility wide, results in a breach of confinement (i.e., leakage into an interfacing system) and dispersal of radiological materials.	Loss of liquid flow through the supply line
FW-12	Specific Location:	
E-3	All Process Units and Support Units with support systems with liquid supply lines to a glovebox Mode: All	· 25-9
	Hazard Sources:	
	Radiological Material (Contamination in support system)	
Load Handling Facility Wide FW-15	A heavy load impacts and damages MFFF structure while utilizing miscellaneous load handling devices resulting in a breach of a primary confinement or in a breach of a container holding nuclear materials.	Human error or equipment failure
E-6	Specific Location: All Process Units and Support Units with radioactive material present	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in container or primary confinement)	

 Table 5A-13. Unmitigated Events, Facility Wide (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or	Location/Hazard Sources	Cause
Location/ Event	<i>t</i>	
Number		
Load Handling	External impact on contaminated drains while	Human error or equipment
	utilizing miscellaneous load handling devices results	failure
Facility Wide	in breach of confinement, and dispersal of	
FW-16	radiological materials.	
LM-10		
·	Specific Location:	
E-6	All Process Units and Support Units with	
	contaminated drains	
	Mode: All	2.5
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	contaminated drain)	
Load Handling	A load impacts the Pneumatic Pipe Automatic	Human error or equipment failure during load handling
Facility Wide	Transfer System while utilizing miscellaneous load handling devices resulting in a breach of confinement	operations around the
Tacinty Wide	and dispersal of radiological materials.	pneumatic transfer piping
FW-17		Fare-man Camping F-Fam
	Specific Location:	
E-6	Facility Wide (Two pneumatic transfer systems)	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in Pneumatic Pipe Automatic Transfer System)	
Load Handling	A transfer container is dropped onto the floor and	1. Human error or equipment
Facility Wide	results in a breach of the transfer container and the dispersal of radiological materials.	failure during container handling operations
FW-20		
	Specific Location:	
E-6	All Process Units and Support Units with transfer	
	containers	
	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in	
	container, e.g. HEPA filters)	
L	I	1

Table 5A-13. Unmitigated Events, Facility Wide (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Load Handling	A load is dropped onto a radioactive material container and results in a breach of the container and	Human error or equipment failure during waste drum
Facility Wide FW-21	the dispersal of radiological materials.	handling operations
	Specific Location:	
E-6	All Process Units and Support Units with radioactive material containers	
	Mode: All	n n
	Hazard Sources:	
	Radiological Material (maximum inventory in container)	
Chemical	A breach of hazardous chemical containers, facility wide, results in a chemical release with potential	Human error or equipment failure
Facility Wide	impact on the worker and on control area habitability.	2. Corrosion of containers
FW-18	Specific Location:	
	Facility Wide	
E-7	Mode: All	
	Hazard Sources:	
	Hazardous Chemicals	

Table 5A-14. Unmitigated Events, General Hazard

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
External Event (Industrial and Transport Infrastructure Accidents)	A transportation accident (fire or explosion) outside the MFFF Building results in structural damage to the MFFF or negatively impacts control area habitability.	Transportation accident
General Hazard	Specific Location:	·
GH-2	Outside AP/MP Building Mode: All	
	Hazard Sources:	_ 23,19
E-8	Radiological Material (maximum inventory in MFFF susceptible to disruption by structural damage)	
External Event (Industrial and Transport Infrastructure Accidents)	A fire or explosion at a nearby facility outside the MFFF Building (e.g., other SRS facility, Pit Disassembly and Conversion Facility, etc.) results in structural damage to the MFFF or negatively impacts control area habitability.	Human error or equipment failure
General Hazard	Specific Location:	
GH-3	Outside AP/MP Building	
E-8	Mode: All Hazard Sources:	
	Radiological Material (maximum inventory in MFFF susceptible to disruption by structural damage)	
External Event	A fire (involving other nearby facilities, nearby vegetation, or vehicles) occurs and affects the MFFF	Forrest fire Nearby vehicle fire
General Hazard	Building resulting in structural damage.	3. Combustibles and unknown ignition source at
GH-13	Specific Location:	nearby facility
E-8	General Plant and Outside Areas Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF susceptible to the consequences of external fires or explosions)	

Table 5A-14. Unmitigated Events, General Hazard

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
External Event General Hazard	A container spill occurs within the site boundary resulting in the dispersal of radioactive material.	1. Vehicular accident
GH-14	Specific Location:	
	Outside Areas	
E-8	Mode: Transportation	
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF susceptible to the consequences of a spill).	21.7

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Table 5A-14. Unmitigated Events, General Hazard (continued)

Event	Unmitigated Event Description/Specific	Cause
Type/Workshop or Location/ Event	Location/Hazard Sources	
Number		
Natural Phenomena	Extreme weather (i.e., a tornado, tornado missiles, or	1. Tornado
(Tornado related	high velocity straight wind) affects the Reagents	2. High velocity straight
chemical release)	Processing Building and results in toxic chemicals	wind
	being released from the vessels, tanks, and piping in	
General Hazard	the building and potentially impacting the worker and control area habitability.	
GH-4	Control area maditadinty.	
04		
	Specific Location:	22.9
E-9	Post of Post of Pull-line	
	Reagents Processing Building	
	Mode: All	
and the second of	Hazard Sources:	
<u>.</u>	Hazardous Chemicals	
	Hazardous Chemicais	
Natural Phenomena	An earthquake up to and including the Design Basis	1. Earthquake
(Earthquake)	Earthquake occurs and affects the MFFF Building.	<u>-</u>
General Hazard	Caralla I anniana	
GH-5	Specific Location:	
Gn-3	Facility Wide	
		1
	Mode: All	
E-9	Hazard Sources:	
	riazard Sources:	
	Radiological Material (maximum inventory in MFFF	
	susceptible to an earthquake)	·
		1. Flooding rain
Natural Phenomena	Extreme weather occurs and affects the MFFF Building resulting in flooding.	1. Plooding rain
(External Flooding)	Building resulting in nooming.	1
General Hazard		
	Specific Location:	
GH-6	Parlin Wide	
	Facility Wide	
	Mode: All	
E-9		
1	Hazard Sources:	
	D. diele die l'Afanciel (manieum inventore in MEEE	
1	Radiological Material (maximum inventory in MFFF susceptible to flooding)	

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Table 5A-14. Unmitigated Events, General Hazard (continued)

Event Type/Workshop or Location/ Event Number	Unmitigated Event Description/Specific Location/Hazard Sources	Cause
Natural Phenomena	Extreme weather (tornado or high velocity straight	1. Tornado
(Tornado)	winds) occurs and affects the MFFF Building	2. High velocity straight
(10mato)		
General Hazard	resulting in failure of dynamic confinement systems	wind
General nazard	due to pressure differential.	l
CII a		
GH-7		
	Specific Location:	
		İ
	Facility Wide	
E-9		
	Mode: All	
;	Hazard Sources:	2.9
i	Radiological Material (maximum inventory in MFFF	
	susceptible to tornado)	
	·	
Natural Phenomena	Extreme weather (e.g., high velocity straight winds,	1. Tornado
(Tornado or High	tornado, or tornado missiles) occurs and affects the	2. High velocity straight
Winds)	MFFF Building resulting in structural damage.	wind
	11 Deliang resident in Statement duringe.	***************************************
General Hazard	·	
	Specific Location:	
GH-8	Specific Excation.	
CII-0	Facility Wide	
	racinty wide	
	36-4- AN	
E-9	Mode: All	
E-9		
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF	
	susceptible to high velocity straight winds, tornado, or	
	tornado missiles)	
Natural Phenomena	Extreme weather (e.g., rain, snow or hail) occurs and	1. Rain, snow, or hail
_	affects the MFFF Building resulting in structural	
General Hazard	damage.	
GH-9	Specific Location:	
	Facility Wide	
E-9	Mode: All	
	Hazard Sources:	
	Radiological Material (maximum inventory in MFFF	
	susceptible to disruption by structural damage)	
	susceptions to disturbation by structural damage)	

Table 5A-14. Unmitigated Events, General Hazard (continued)

Event Type/Workshop or Location/ Event Number Natural Phenomena General Hazard GH-10 Extreme weather (excessive high temperature) occurs and affects the MFFF Building resulting in a thermal excursion in the process areas or in the PUO2 storage area. Specific Location: Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to excessive high temperature in the environment) Natural Phenomena General Hazard GH-11 Specific Location: E-9 Facility Wide MoffFF Building resulting in failures of electrical equipment or external fires or explosions potentially impacting control area habitability. Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena General Hazard Specific Location: Land subsidence affecting the MFFF Building results in structural damage. Specific Location: Specific Location: 1. High Temperature in environment environment 1. Lightning 2. Lightning 3. Lightning 4. Lightning 4. Lightning 5. Lightning 6. Lightni	
Natural Phenomena General Hazard General Hazard GH-10 Extreme weather (excessive high temperature) occurs and affects the MFFF Building resulting in a thermal excursion in the process areas or in the PUO2 storage area. Specific Location: Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to excessive high temperature in the environment) Natural Phenomena General Hazard GH-11 Specific Location: E-9 Facility Wide Mode: All Hazard Sources explosions potentially impacting control area habitability. Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena General Hazard Land subsidence affecting the MFFF Building results in structural damage.	
General Hazard and affects the MFFF Building resulting in a thermal excursion in the process areas or in the PUO2 storage area. Specific Location: Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to excessive high temperature in the environment) Natural Phenomena General Hazard GH-11 Specific Location: Facility Wide Mode: All Hazard Sources: Radiological Material fires or explosions potentially impacting control area habitability. Specific Location: Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena General Hazard Land subsidence affecting the MFFF Building results in structural damage.	_
Area. Specific Location: Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to excessive high temperature in the environment) Natural Phenomena General Hazard General Hazard GH-11 Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF suite equipment or external fires or explosions potentially impacting control area habitability. E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena General Hazard Land subsidence affecting the MFFF Building results in structural damage.	the
Specific Location: Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to excessive high temperature in the environment) Natural Phenomena General Hazard General Hazard Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions potentially impacting control area habitability. Begin to the source of the susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena General Hazard Land subsidence affecting the MFFF Building results in structural damage.	
Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to excessive high temperature in the environment) Natural Phenomena General Hazard General Hazard GH-11 Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena General Hazard Natural Phenomena Land subsidence affecting the MFFF Building results in structural damage.	
Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to excessive high temperature in the environment) Natural Phenomena Extreme weather (lightning) occurs and affects the MFFF Building resulting in failures of electrical equipment or external fires or explosions potentially impacting control area habitability. Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena General Hazard Land subsidence affecting the MFFF Building results in structural damage.	
Radiological Material (maximum inventory in MFFF susceptible to excessive high temperature in the environment) Natural Phenomena Extreme weather (lightning) occurs and affects the MFFF Building resulting in failures of electrical equipment or external fires or explosions potentially impacting control area habitability. Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena General Hazard Land subsidence affecting the MFFF Building results in structural damage.	
Susceptible to excessive high temperature in the environment) Natural Phenomena General Hazard General Hazard General Hazard GH-11 Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena Ceneral Hazard Land subsidence affecting the MFFF Building results in structural damage.	2.3
General Hazard General Hazard GH-11 MFFF Building resulting in failures of electrical equipment or external fires or explosions potentially impacting control area habitability. Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena Ceneral Hazard Land subsidence affecting the MFFF Building results in structural damage. 1. Land subsidence	
General Hazard equipment or external fires or explosions potentially impacting control area habitability. Specific Location: Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena Ceneral Hazard Land subsidence affecting the MFFF Building results in structural damage.	
GH-11 Specific Location: E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena Land subsidence affecting the MFFF Building results in structural damage. 1. Land subsidence	
E-9 Facility Wide Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena Land subsidence affecting the MFFF Building results in structural damage. 1. Land subsidence	
Mode: All Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena Land subsidence affecting the MFFF Building results in structural damage. 1. Land subsidence	
Hazard Sources: Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena Land subsidence affecting the MFFF Building results in structural damage. 1. Land subsidence	
Radiological Material (maximum inventory in MFFF susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena Land subsidence affecting the MFFF Building results in structural damage. 1. Land subsidence	
susceptible to the consequences of failures of electrical equipment or external fires or explosions) Natural Phenomena Land subsidence affecting the MFFF Building results in structural damage. 1. Land subsidence	
General Hazard in structural damage.	
General Hazard	
GU 12 Specific Location:	
GH-12 Specific Location:	
Facility Wide	
E-9 Mode: All	
Hazard Sources:	
Radiological Material (maximum inventory in MFFF susceptible to disruption by structural damage)	

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